# TWENTY-SEVENTH QUARTO VOLUME.



From January 1, 1895, to December 31, 1895.

# RAILROAD GAZETTE

A JOURNAL OF TRANSPORTATION, ENGINEERING AND RAILROAD NEWS.



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RAILROAD GAZETTE

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CONTENTS



## Contributions.

### Those Freight Car Specifications.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Your editorial of the 7th inst., in reference to those freight car specifications, and the letter from M. C. B., of the 14th inst., greatly interest me. Keep this up; you are on the right track. What is now needed is a little more light on the management and bookkeeping of many of our railroad corporations.

The United States Government never specify any proprietary article when they can avoid it; they leave the matter open to the competition of citizens. Our railroads should do the same, as it is not possible for any one firm to make the only wheels, springs, paints, etc. The Pennsylvania Railroad, the Boston & Albany, and many others, specify that their standard materials can be obtained from several manufactuers (and name the firms who can supply their standards). This gives the car-builder a chance for competition on his raw material.

As M. C. B. says, open competition is the best for all; it takes the rust from our brains. Many of our railroads are managed on honest business principles, as Uncle Sam manages the Navy, War and Post-Office Departments; and when our receivership roads copy after the above institutions, we will have our assessments spent where they will do the stockholders some good.

STOCKHOLDER.

[We object to any imputation on the bookkeeping or the honesty of the people concerned in the matter to which this correspondent refers. No such inference is to be drawn from our note on the subject. We merely raised the question of the business policy of such specifications.—EDITOR RAILROAD GAZETTE.]

### A Staybolt Problem.

TO THE EDITOR OF THE RAILROAD GAZETTE:

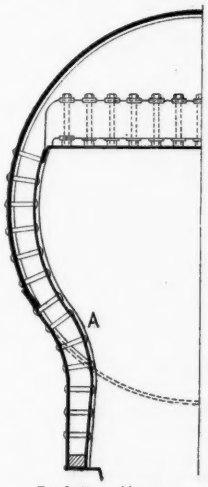
Is there a greater tendency to bulge between staybolts below the point A, as shown in the cut below, than above it?

MASTER MECHANIC.

### Stationary Boiler Practice.

BY AN ENGINEER.

It sometimes appears to me that some of the best railroad mechanics, in their desire to keep abreast of their neighbors in the advanced state of mechanical arts, neglect important every day details of shop practice. It is upon these details and the way they are looked after that economy and efficiency depend. One direction in which there often seems a want of attention, and where economies can be effected, is the design, setting and working of stationary boilers, especially when designed for the use of soft coal. A review of some of the most common faults, and suggestions as to remedies, may not be amiss.



*See Letter Above.*

The first requisite condition for the efficient working of a boiler plant is a good draft, which, for coal burning should not be less than three-tenths of an inch of water when measured with a draught gage. A poor draught is often found to exist when the chimney is of sufficient height and area. In such cases, careful testing will soon show whether there is a local stoppage through the accumulation of ashes at any point, or whether the area of breaching, dampers, connections or uptake are too restricted. This class of defects can usually be remedied promptly and cheaply, with an immediate result in economy of fuel and increased work done by the boilers.

Another class of faults arises from want of care in making turns in the smoke passages. These should be in curves rather than at right angles, and pains should be taken that the current of gases from one furnace does not conflict with that from another, so as to spoil the draught.

We may find that the boilers are set too closely to the grates, so that there is not room for the proper development of the gases. Not less than 20 in. should be allowed between the bottom line of the boiler and the grate, otherwise there is a chilling effect from the comparatively cool mass of the boiler. When it is not expedient to rebuild the setting entirely, a remedy may be cheaply reached by dropping the ends of the grates at the bridge wall a few inches. This gives more room at the part of the furnace where the amount of the various burning gases is the largest, and the slant in the grates improves the action of the fire to some extent.

Grates are constructed in many cases without due regard to the amount of air openings through them, and it is not unusual to find furnaces in which the openings are not more than 15 or 20 per cent. of the total grate area. For burning any grade of coal the nearer we can reach 50 per cent. of the grate area in openings the better.

The area of the grates is occasionally greater than the boiler or the flue area demands. From this fault come a sluggish fire, poor draught, and imperfect combustion. With a fair draught a grate the width of the boiler diameter need not be over 4 ft. in length with any ordinary grade of soft coal. With slack, however, one foot extra in length will give good results.

It is seldom that any provision is made for admitting air over the fire to burn the hydrocarbon gases. Without going too much into details here, it is safe to say that these gases cannot be burned without an air supply. With the proper conditions for good combustion, the air supply passages over the fire may be fully one-twentieth of the grate surface with heavy firing, or one thirty-fifth with ordinary firing.

No matter how much air is let in over the fire, we cannot obtain a good combustion of the hydrocarbon gases unless there is an intimate admixture under conditions of intense heat. In ordinary boiler settings, we often find the area of the passageway over the bridge wall so large that the air and gases pass over in separate layers without the proper admixture and combustion. Means should be taken to reduce this area so that the flame will just fill it with heavy firing, which can always be readily done. An area over the bridge wall of about one-fifth of the grate area will usually give good results.

The flameway between the bridge wall and the point where the burned gases reach the flues should be long enough to allow the completion of the process of combustion which is being carried on, as far as there is any visible flame. Neither should the flame bed extend down to the ground, as is sometimes the case. The currents of air and gases under the boiler seem to interfere with each other under such conditions, but the flame bed, while allowing more room than at the bridge wall, should still be shallow. Boilers for ordinary bituminous coals should not be less than 18 ft. long when the diameter is 60 in. or more.

The products of combustion are too often allowed to pass into the chimney from the tubes at a comparatively high temperature, thus wasting heat. This may be obviated by passing them over the top of the boiler under the brick jacket, and putting the chimney at the opposite end to where we usually find it. This is done in many places with good results in fuel economy.

The faults to which attention is here called are nearly all such as can be easily remedied, and their elimination may make in some cases a saving of fully 50 per cent. in the fuel bill. It may be argued that they are such commonplace items that there is no need of calling attention to them, but a little investigation will show that some or all of them exist in some steam plants on every large road in the United States. I know whereof I speak.

### Influence of the Size of Grain on the Strength of Cement and of Cement Mortar.*

At the last annual meeting of the Association of German Portland Cement Manufacturers, attention was called to a heretofore little-known property of Portland cement. Under discussion was a patent of the firm of Smidth & Co., of Copenhagen, on sand cement mortar, in which Portland cement is ground together dry with a lean substance like sand; the product is mixed afterwards with a lean material. An additional patent has been applied for with the claim to limit the above procedure to a mixing of the cement with a lean material and subsequent grinding in the dry state; the product to be used in construction directly in place of the pure cement. Good results are said to be obtained if two to three parts of sand are added to one part of weight of cement. The hardness and strength of sand cement are claimed to be scarcely inferior to those of pure cement; besides being cheaper they give a smooth surface and undergo smaller changes of volume in consequence of the lesser proportion of cement.

In connection with and in opposition to these claims Mr. Dyckerhoff publishes the results of a series of experiments. Already, in 1884, he had experimentally proved that equal admixtures of sand, trass, limestone, etc., to cement, ground to the same fineness as the latter, diminish its strength almost equally. More recently Mr. Dyckerhoff has instituted tests in order to show that it is the same whether a lean substance like sand is ground together with cement or whether the constituents, both ground to even fineness, are mixed afterwards. One part cement and three parts sand were ground together so finely that the product gave a residuum of only 9.8 per cent. on a sieve with 32,200 meshes per sq. in. Its weight per cu. ft. was 63 lbs. (1,006 g. per litre). Further, cement and sand were ground separately so that the residuum of the cement was 10 per cent. and that of the sand 10½ per cent. Both materials were mixed in the proportion of 1 to 3, the mixture weighing about the same as above (1,002 g. per liter). Tests of the two compounds under admixture of one and three parts of "normal" sand resulted as follows:

Normal sand has to pass one sieve with 387 meshes per sq. in. and must be retained by a second sieve with 774 meshes per sq. in.

| | Tensile strength in lbs. per sq. in. | |
|---|---|---|
| Ground together. | 7 days. | 28 days. |
| 1 Cement, 3 Sand, 12 Normal Sand | 82.3 | 125. |
| 1 Cement, 3 Sand, 4 Normal Sand | 162. | — |
| Mixed together. | | |
| 1 Fine Cement, 3 Sand Powder, 12 Normal Sand | 86.6 | 123.2 |
| 1 Fine Cement, 3 Sand Powder, 4 Normal Sand | 157.2 | — |

The results are nearly the same whether the materials are ground or mixed together, provided they are of equal fineness in both cases. This shows that in mixing mortar the sand powder might be added to the fine cement at the building site.

The favorable experiences with cement lime mortar caused the inference that the sand powder might expeditiously be replaced by hydrate of calcium.

Tests with the following two mortars resulted thus:

| | Tensile strength in lbs. per sq. in. after 7 days. |
|---|---|
| 1 Fine Cement + 3 Sand Powder + 12 Quartz Sand. | 101. |
| 1 Fine Cement + Hydrate of Calcium + 12 Quartz Sand | 125. |

It has been stated above that the cement for the experiments had been ground very finely. But the grinding of the cement must not be carried to excess. Cakes of pure cement ground so finely as to pass entirely through a 32,200-mesh sieve, cracked, when exposed to the open air, much more than such of cement of ordinary grinding. A number of fat mortars of one part sand to one part cement were tested as to their behavior when setting in the open air. Four different brands of German Portland cement were used, partly as ground ordinarily, partly ground extra fine.

The results were the following:

COMMERCIAL CEMENT AND FINE CEMENT SETTING IN THE OPEN AIR.

| Quality of Cement. | Weight of 1 cubic foot in lbs. | Residum in per cent. 32,200 meshes per sq. in. | Residum in per cent. 58,000 meshes per sq. in. | Tensile strength. 1 Cement, 1 Sand. 7 days. | 28 days. | 1 year. | 2 years |
|---|---|---|---|---|---|---|---|
| I. Commercial Cement | 65. | 25.2 | 4.0 | 306 | 327 | 721 | 881 |
| I. Extra Fine Cement. | 54.6 | 0 | 0 | 378 | 396 | 709 | 710 |
| II. Commercial Cement | 79.3 | 25.5 | 3.2 | 333 | 475 | 681 | 824 |
| II. Extra Fine Cement. | 54.9 | 0 | 0 | 359 | 481 | 659 | 751 |
| III. Commercial Cement | 72. | 24.0 | 4.2 | 237 | 354 | 717 | 798 |
| III. Extra Fine Cement. | 55.5 | 0 | 0 | 295 | 445 | 796 | 728 |
| IV. Commercial Cement | 62.9 | 24.3 | 5.0 | 226 | 278 | 625 | 784 |
| IV. Extra Fine Cement. | 51. | 0 | 0 | 262 | 347 | 513 | 571 |

All test pieces set in water for the first three days and in the open air afterwards. Most of the test pieces of fine cement showed hair cracks, which was not the case with the coarser cements.

The tests show that after 7 and 28 days the finely-ground cements showed a higher tensile strength than the commercial ware, dropping below the latter after two years. Very fine cements set quickly in the beginning, but become very slow setting when being stored. Due to the large surface of cement powder very fine cement, even if burnt hard, absorbs the moisture and carbonic acid of the atmosphere comparatively quickly and becomes lumpy.

*Abstracted from the Centralblatt der Bauverwaltung.

### Rapid Transit in New York.

At a meeting of the New York Rapid Transit Commission, held Dec. 26, the Chief Engineer, Mr. William Barclay Parsons, submitted a report on the feasibility of the designs provisionally adopted, and suggesting a modification and also giving estimates of cost. This report is approved by Mr. Alphonse Fteley and Mr. Theodore Cooper, two names which everybody will admit carry great weight. The principal points in the report are given below, and we reproduce from Mr. Parsons' drawings a sectional view of the suggested arrangements.

The Board instructed its Chief Engineer to report on the objections, if any, to the plan of construction provisionally adopted, on the objections to a double deck plan, to make suggestions such as he might deem pertinent and to give estimates of cost. It authorized him also to call in Messrs. Fteley and Cooper. What follows is nearly verbatim from the report.

*Objections to Plans Adopted.*—The objections to the provisionally adopted plans are:

First.—The cross-section is entirely too small for the safe and efficient working of a rapid transit railroad. Where fast trains will be running at close intervals throughout both day and night, it is necessary to provide more accommodation for inspectors and trackmen than is

done in ordinary railroad tunnels, in order that the men may have reasonable faith in their own safety, and devote their attention to the full performance of their duties. With cars similar to those used on the Manhattan Railway, a width of 50 ft. in the clear between side walls is the minimum that can give the required facilities; 44 ft. would be too narrow.

The standard car of the Manhattan Railway has been adopted for use in the suburban service on the Harlem River branch of the New York, New Haven & Hartford and on the New York & Northern branch of the New York Central Railroad, and in order that the Rapid Transit Railroad may have similar facilities for transfer for suburban business over surface railroads, it appears advisable to accept such a car as the size to be run on the proposed road. Such a car requires in the tunnel a clear height of 13 ft. instead of 11 ft. 6 in. as per the adopted plans.

Second.—The provisionally adopted plans give no consideration to the question of sewers. It was shown in my report of Nov. 20, 1894, that Broadway has sewers for 62 per cent. of its length south of 14th street. With those plans, not only must these sewers be reconstructed in advance of the railroad work and outside of its walls, but provision must be made for the construction of sewers along the balance of the route. The reconstruction of the sewers can only be done through disturbance of the street surface. The railroad and sewers would require a total width of at least 62 ft. Such a width would not only occupy a large part of the vault spaces along Broadway, but would bring the excavation so close to the buildings as to require a large amount of underpinning of their foundations. Work of that description is very expensive, and is accompanied with great risk. It involves so many contingencies as to make a reliable estimate almost impossible.

The construction of a four-track road as shown on the plans, without disturbing the surface of the street, involves tunneling methods that are without precedent.

The success of such methods is entirely problematical, and the great risks to all the interests involved do not justify their consideration. Broadway is not the place for experiments. The only practical method by which such a road can be constructed would be by open cut, although the objections as to requiring underpinning of the abutting buildings and the invasion of property rights would still remain.

The objections to a "double deck" plan, especially if a clear height in each tunnel of 13 ft. were required are:

First.—A much deeper excavation, keeping the street open for longer periods, due to the greater concentration of work, and involving the underpinning of foundations. Second.—The upper tracks would not be on a solid foundation, and would therefore increase the vibration and noise. Third.—The distance from the street level to the platforms of the lower tracks would generally necessitate elevators.

*The Elm Street Route.*—The construction of a four-track road in Broadway by any plan will be open to many objections. Broadway is the one great thoroughfare in the lower part of the city; it is lined with expensive buildings and its traffic at all times is very heavy. These conditions will inflict an increased cost on the construction of a railroad, and the crowding of the work of building it in a congested street must interfere with regular business. A result equally advantageous to the city at large can be accomplished, in my opinion, by building a four track railroad from Union Square through New Elm street to the City Hall, and thence a 2-track line through Nassau and Broad streets to the South Ferry. This can be supplemented at any time, if desired, by a two-track road from Union Square through University Place, Greene and Church streets to the City Hall. Since the express trains would make no stops between 14th street and City Hall, the two track road on Church street would give the same accommodation between those points to the territory west of Broadway that the four tracks do to that east of Broadway.

If, however, you do not accept these suggestions, and decide to adhere to the Broadway route with four tracks, I submit for your consideration the following plans, which have been designed to lessen the objections stated.

*The Plans Suggested.*—The principle of the design is the treatment of the local tracks and the express tracks as separate railroads, and the construction of each double track independent of the other, so as to obtain the maximum of efficiency for both.

The former would naturally follow the undulations of the street as closely as possible, in order to have a minimum depth at the station platforms, while the express line should have shallow stations at long distances and between these stations be run on more favorable gradients. The express stations will be located probably at City Hall and Fourteenth street. At City Hall the platforms can be kept near the surface, and at 14th street all tracks can be brought to the same level, or a double-deck station can be constructed, as may be preferred. The double-deck station presents the advantage of a separation of the tracks at the 14th street junction, and also of a possible continuation of the method of the proposed construction as far as 34th street, so as to pass the narrow portions of Broadway at 18th street and 28th street, without the difficulty attending the construction of four tracks on a level. By this method there will be less interference with the vaults or private property, and as the excavation will be at a greater distance from the house lines there will be less necessity for underpinning. The railroad would be constructed by taking one-half of the street at a time, laying the side walls in a trench, and then turning half the arch. The other half of the tunnel would be completed later. All the material beneath this arch could be excavated after the latter was completed and the street surface restored. The lower tunnel could be constructed by means of circular shields, and as these would be driven beneath the masonry tunnel previously constructed, there would be little danger of a movement of the ground sufficient to affect the stree surface. The running of the cable railroad would not be interrupted.


Suggested Rapid Transit Routes in Lower New York.

The material used in the construction would be of the most durable nature, as the upper tunnel would be constructed entirely of masonry, and would not be corroded as iron would be, by the gases and acid and other substances with which the soil next to the surface is saturated.

This plan also presents the advantage of the city being able, in conjunction with this work or subsequently, to build pipe galleries on the haunches of the arch.

*Estimates of Cost.*—The making of an estimate in advance of detailed plans is always a difficult matter, but especially so in this case, on account of the complicated character of the work. Where buildings will have to be underpinned and property rights invaded, it is almost impossible to make reliable figures. How far property rights go with the vaults, and whether the owners can or will make any claim for compensation for their loss or to what extent claims for other damages will be made must be left for others to decide. To the item for the construction of the provisionally adopted plans there must be added these additional amounts.

Having advised you that it is not reasonably practicable to build a four-track railroad without disturbing the surface of the street, I make no estimate for the work done in that manner.

In the estimates herewith presented I have added a large amount for contingencies, which is intended to cover such as may arise during construction, but nothing has been allowed for property rights or damages to abutting property.

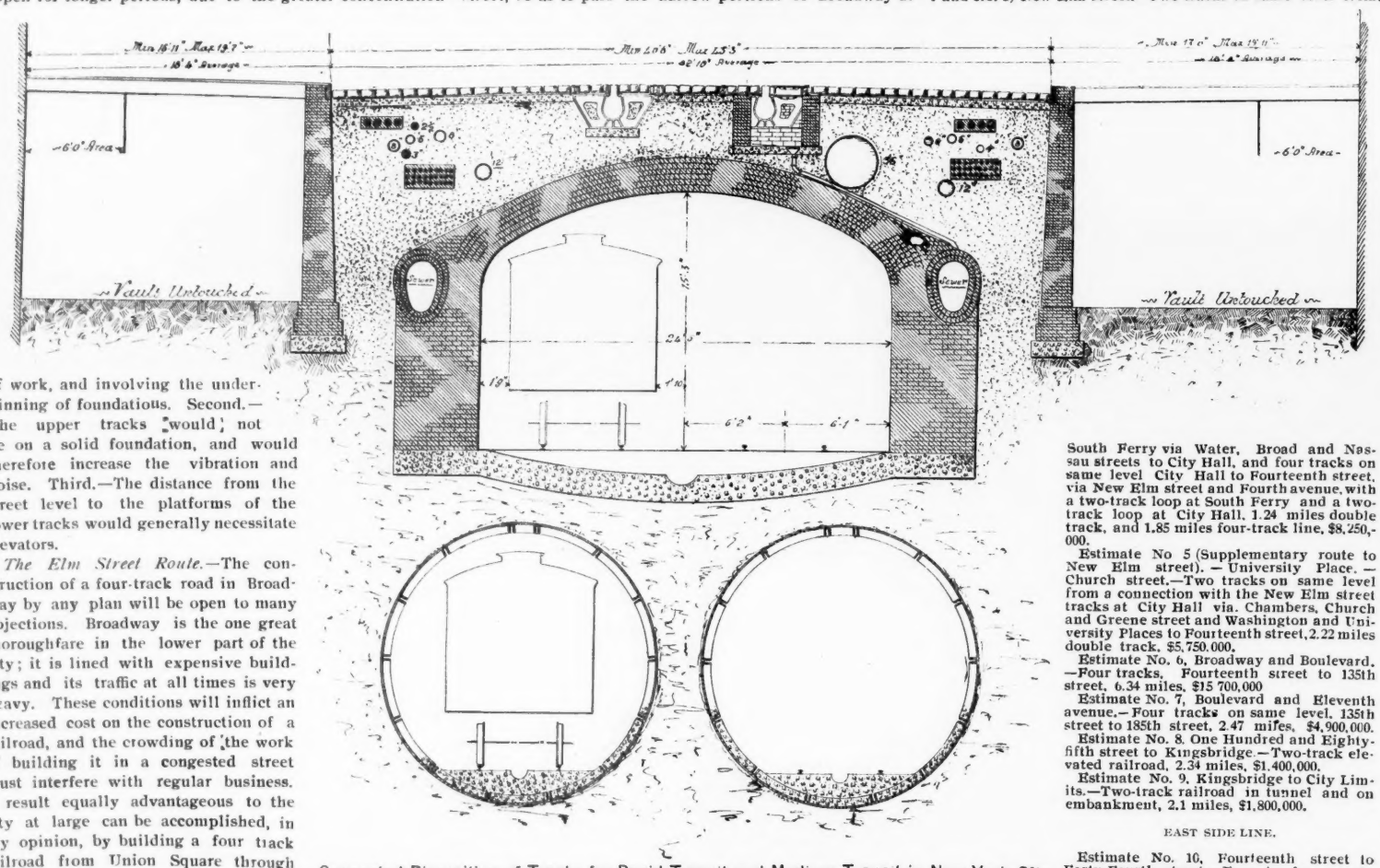
Each of these estimates includes construction of railroad and station, reconstruction of sewers, restoration of street surface (except in the case of new Elm street, estimate No. 4), allowance for commissioners covering unforeseen elements of construction and interest during construction.

Estimate No. 1 (Broadway).—Two tracks on the same level from South Ferry to Vesey street, with a two-track loop at City Hall, 1 mile; to be constructed from the surface, $2,250,000.

Estimate No. 2 (Broadway).—Four tracks on same level, Vesey street to Fourteenth street; a two-track loop at City Hall; 1.85 miles four-track and 0.45 miles double-track line; constructed from surface, $10,800,000.

Estimate No. 3 (Alternate plan for estimate No. 2).—Four tracks from Vesey street to Fourteenth street, as per plans submitted, with a two-track loop at City Hall; 1.85 miles four-track, and 0.45 miles double-track, $9,900 000.

Estimate No. 4 (Alternate route for No. 1 and No. 2, or No 1 and No. 3) New Elm street.—Two tracks on same level from South Ferry via Water, Broad and Nassau streets to City Hall, and four tracks on same level City Hall to Fourteenth street, via New Elm street and Fourth avenue, with a two-track loop at South Ferry and a two-track loop at City Hall, 1.24 miles double track, and 1.85 miles four-track line, $8,250,000.




Suggested Disposition of Tracks for Rapid Transit and Medium Transit in New York City

Estimate No 5 (Supplementary route to New Elm street).—University Place.—Church street.—Two tracks on same level from a connection with the New Elm street tracks at City Hall via. Chambers, Church and Greene street and Washington and University Places to Fourteenth street, 2.22 miles double track, $5,750.000.

Estimate No. 6, Broadway and Boulevard.—Four tracks, Fourteenth street to 135th street, 6.34 miles, $15 700,000

Estimate No. 7, Boulevard and Eleventh avenue.—Four tracks on same level, 135th street to 185th street, 2.47 miles, $4,900,000.

Estimate No. 8. One Hundred and Eighty-fifth street to Kingsbridge.—Two-track elevated railroad, 2.34 miles, $1,400,000.

Estimate No. 9. Kingsbridge to City Limits.—Two-track railroad in tunnel and on embankment, 2.1 miles, $1,800,000.

EAST SIDE LINE.

Estimate No. 10, Fourteenth street to Forty-Fourth street.—Four tracks on same level, 1.5 miles, $4,600,000.

Estimate No. 11, Forty-fourth street to Mott Haven.—Two double-track tunnels, Forty-fourth street to Ninety-seventh street, four-track steel viaduct to Mott Haven, 5 miles, $15,000,000.

Estimate No. 12, Mott Haven to Kingsbridge.—Two-track steel viaduct, 5.5 miles, $2,600,000.

Estimate No. 13, Shops, Storage Tracks, Terminal Yards, etc.—Ten per cent. of the total estimate of the line.

The Commissioners voted to submit the report to a board of five expert engineers who are to be requested to report upon the following points:

"First.—Whether the calculations as to probable cost

embodied in this report may be properly accepted by this Commission as a basis for its conclusions.

"Second.—Whether they concur in believing the plan of construction in Broadway proposed by the former commission unsatisfactory for the reasons suggested by the Chief Engineer or for any other reasons.

"Third.—Whether the plans submitted by the Chief Engineer of treating the local and express tracks as two roads, using the same stations when they join, appears to them practicable and wise.

"Fourth.—Whether they can suggest any better solution of the problem before the Commission than has already been brought forward.

"This last question is intended to open the way for the most free suggestion, so that none can say hereafter that the engineers were asked only to act upon specific questions submitted to them, but were not asked to propose of their own notion such a solution as might seem to them wise."

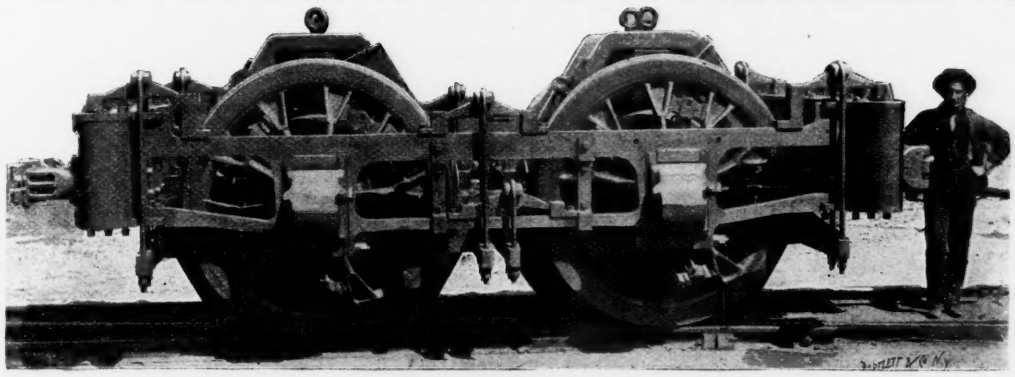
## The Baltimore & Ohio Electric Locomotive.

We are glad to be able to state that an electric locomotive for handling trains through the new Belt Line tunnel of the Baltimore & Ohio in the city of Baltimore will probably be in operation in the early part of this year. This is as definite a time as the General Electric Company will fix, but the work on the locomotive and the generating machinery is now progressing steadily, and it is believed that the locomotive as now constructed will meet the requirement. The engravings which we publish with this show two views of one of the locomotive trucks.

The trucks are of forged iron, each resting upon four driving wheels of cast-steel, 62-in. diameter. Flexibly supported upon each of these trucks are two six-pole gearless motors, one for each axle, transmitting motion from the armatures to the wheels by an especially designed flexible coupling. The method of spring suspension allows of the immediate adjustment of the wheels to the irregularities of the tracks, lessening the wear both to the motors and the track. The armatures are of the iron-clad type. A hollow shaft serves to carry the armature, and through this passes the wheel axle, to which it is connected by the universal coupling already mentioned which allows of freedom of movement in any direction. The complete motors which are the largest railroad motors in the world, are so set on the truck that they will be easy of access under all circumstances.

The cab, which will be spring supported on the truck frame, will be of sheet iron and wood and will have windows on all sides. Within the cab will be the series parallel controller and the air pump, operated by a small electric motor, which will supply the air for the compressed air brakes and the whistle. The locomotive will be also equipped with bells, safety devices, etc., and will have a Janney coupler at each end.

The finished locomotive will weigh 95 tons, will be 14 ft. 3 in. long, 9 ft. 6¾ in. wide, and will be of standard guage. The maximum speed will be 50 miles an hour. This will be reduced to 30 miles an hour when only half the draw-bar pull is exerted and to 15 miles an hour when with full draw-bar pull. The average speed of the loaded train will be about 30 miles an hour. It can of course be run either forward or backward.



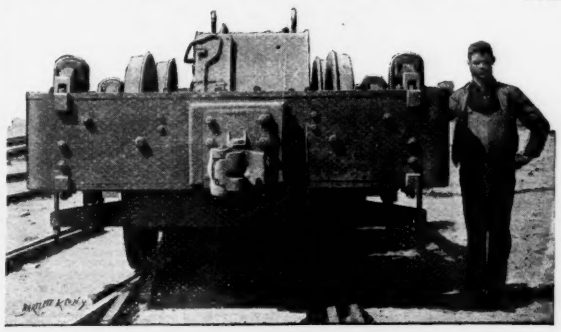
**One Truck of Electric Locomotive for the Baltimore & Ohio Railroad.**

This locomotive is designed for heavy work, and will be called upon to handle trains as heavy as those now handled by heavy steam locomotives. A test of one of the completed trucks as shown, representing one-half of the locomotive, was recently made upon the tracks at the Schenectady works of the construction company. In order to obtain the necessary load a New York Central heavy six-wheel engine was made use of, and the electric locomotive truck coupled to it. The machines were then sent in opposite directions and pulled at the connecting coupling as in a tug of war. The electric locomotive had a slight advantage over the steam engine in weight on the driving wheels, and pulled it up and down the track with apparent ease. For the same weight upon the drivers it was shown that the electric locomotive will start a greater load than the steam locomotive, the pull being constant throughout the entire revolution of the wheel, the difficulty of variation of pull with the angle crank as in the steam locomotive being eliminated. The test also proved that not only were the motors sufficiently powerful, but that the driving mechanism and armature couplings are amply strong to transmit the torque of the armature to the axle.

The power house is rapidly nearing completion and the generating machinery is almost ready for installation. The overhead apparatus which has been especially designed to meet the extraordinary requirements will shortly be in position.

## The M. C. B. Coupler.

The M. C. B. coupler was discussed at considerable length at the November meeting of the Western Railway Club, the discussion being devoted chiefly to questions of materials. At the December meeting very little time was given to the topic, but it was refreshing to have a railroad man "speak right out in meetin'" as did Mr. Barr, of the C. M. & St. P., when he offered the following remarks, concerning the mechanical details of couplers as considered aside from questions of material. Mr. Barr said:



**Truck of Electric Locomotive.**

"It seems to me that in our investigations on couplers, we are looking almost exclusively on quality of the material; which is a very proper thing. But we seem to be neglecting mechanical details, and to-day I do not know any coupler that really meets the actual requirements in mechanical details. It seems to me we should have a coupler, which, when the switchmen perform the uncoupling operation, will remain uncoupled so that it is not necessary to pull the car away, and which, when the cars are separated, will be in condition to couple again without the necessity of the switchman returning and performing another operation to put it in condition for coupling. If couplers operated in this way, I think switchmen could handle at least 30 per cent. more cars than they do at present. It seems to me that a coupler ought to be devised on which the uncoupling operation can be performed whether the engine is ready to separate the cars or not, and that, when this operation is performed, the coupler be in such condition that when it is pushed against another car it will couple again without any further labor or attention on the part of the switchmen. This is one point. Another point is this: In all our couplers, so far as I know, it is necessary to turn a handle up, or pull a handle, at the side of a car, and to lock the handle there in order to keep the catch in the coupler from falling back into locking position. If you will look at it you will readily see that this is an extremely clumsy device. The position of the coupler, the length of chain, the arrangement of the cranks for lifting the pin, and the device for locking the cranks in position, must be very closely adjusted. Now, if some device were gotten up in which this operation was performed in the coupler itself we would have a much improved coupler. It seems to me that a more clumsy arrangement for holding a coupler unlocked could not be very well devised; but almost every coupler is designed on these lines. These are the two main points from a mechanical point of view, in which, I think, the coupler up to date is very far from being perfect. In addition to this, I am inclined to think that the coupling in which the locking device moves forward and backward is not a proper one, as a surge of the train may cause the lock to move backward and allow the train to uncouple. I know some prominent couplers are constructed in this way, but, nevertheless, I am of the opinion that it is not a proper construction."

Mr. C. A. Schroyer, of the C. & N. W., said:

"I want to make one criticism in regard to Mr. Barr's remarks, and that is the necessity of an automatic coupler, which, when the locking block or locking pin itself is raised when the cars are in contact, will remain in that condition until the cars are detached. That would be all right enough if it was necessary for a switchman in doing his switching to go alongside of his cars and make the cuts the entire length of his cars, and back them up where he wants them to go. In making the cuts of your train they must be made individually, and those cuts cannot be made with any coupler on the market to-day as long as there is any tension on the couplers. In order to relieve these couplers of the tension the train must move backward, and at that time the switchman does the uncoupling, and as soon as that is made the lock can be dropped and it always is dropped. That is the general practice and there is no inconvenience at all. Those suggested improvements are all right theoretically, but I do not think that they can be obtained. The idea of an automatic coupler is an automatic coupler and not an automatic uncoupler—that is, a coupler that can be coupled without going between the cars, and this they all do."

Nothing further was said upon these features of mechanical details of M. C. B. couplers, but there were present (and absent) many club members who would have liked to hear or read a much more extended discussion upon them.

## The Hungarian Railroads.*

BY A. E. ZIFFER, C. E.

In Hungary the activity of those who are interested in the development of railroads is directed, for the most part, to roads having a purely local interest. During the past few years these latter lines have made surprising strides, due to the great sacrifices that have been made and are still being made by the country.

Towards the latter part of 1860 the construction of local railroads was begun in Hungary. The Government laid down the principles that were to control the construction of lines of the second order (standard gage) and of the third order (narrow gage). The building of these roads was accomplished under special laws and by the co-operation of the State and the railroad companies. But success did not attend these special regulations and laws. The demand for means of communication with a view of constructing well-built railroads arose afresh, and for two reasons: In the first place because throughout a great portion of the country bad construction the highways and railroads were either insufficient to meet the demands or were in an almost impassable condition and the great expense of maintainance that they demanded; and secondly, because on account of the rising interest that was taken in agriculture and arboriculture, and the advances which manufacturing industries were making, it became absolutely necessary that the movement of all these products should have the benefit of more rapid and economical transportation.

Owing to the continued efforts of municipalities, communes and individuals, a law was enacted March 4, 1884, by the terms of which the State granted to all railroads of local interest exemption from imposts and taxes for a period of 30 years, as well as contributions to the customs, police and other services. In addition to this, it was also enacted, that if the well-being of the State should seem to require it, the latter would share in the expense of construction; that very favorable contracts should be made for the transportation of the mails; that a subsidy of 300,000 florins ($108,000) should be provided for the construction of local railroads with the proviso that, without a special act of Parliament, this should not exceed 10 per cent. of the capital stock; that material for railroad construction should be carried at a low figure by the State railroads; that the State railroad shops should construct locomotives and provide other materials. In addition to these there were some other concessions relating to connections, the subscription to the capital stock of new roads, guarantees, fixation of capital stock and taxes.

As a result of this legislation, the length of railroads increased from 1,831 kilometers (1,135 miles) in 1888, upon which the gross receipts were 1,839 florins ($662) per mile, to 3,733 kilometers (2,314 miles) in 1893, with gross receipts amounting to 2,131 florins ($767) per mile; showing an increase of 103.8 per cent. in mileage, and 136.3 per cent. in gross receipts. Up to the end of 1892 there were 60 lines in operation, upon which there were 108 locomotives, 236 passenger cars and 1,714 freight cars.

The paper then gives reports in detail of the subscriptions to stock and construction account that have been made by the Government, the communes, the connecting lines and individuals to the numerous lines of local interest that have been built, and concludes with the statement of the net earnings of the several lines. These earnings have varied from 1 per cent. to 11.6 per cent. This comparatively favorable showing is due, in part, to the relatively high tariffs for passengers and freight, and, partially, to the operating agreements made with the State railroads. According to these agreements the State received a fixed income for each passenger-mile and ton-mile, the result of which was that, in every case, there was a profit, which would have been halved if the private enterprises should have incurred any outlays outside of the regular operating expenses.

It may also be observed that the Hungarian zone tariff which was first applied on a few roads of local interest, seems to be extending more and more, and has been introduced on several roads during the present year. Nevertheless, it should be remembered that in spite of the subsidy furnished by the Hungarian State Railroads under the form of aid in construction (300,000 florins at least) the net receipts of these local roads are insufficient to pay the interest on the first mortgage bonds, and that these securities receive, as a general rule, no interest.

In view of this state of affairs it has become necessary to consider what should be done to raise the productive efficiency of these roads.

To accomplish this, it would first be necessary to effect some economies in the operating expenses, and this should be done by an operating administration, for operations that are carried on by the State are bound down by regulations and are not elastic enough to meet the case. So that the State would be simply the gainer by abandoning this burden, for it already has enough to carry.

Economy in first cost could only be attained by the introduction of the narrow gage, as was done for the first time in 1892, when a project for a concentrated system of

*Abstracted from a paper published in the September issue of the Bulletin of the International Railroad Congress.

narrow gage lines was broached for northwestern Hungary, and which was the more important as the mountainous countries in the north and east are insufficiently provided with means of transportation.

The first local road constructed in Hungary was one built from Pressburg to Tyrenau, which had a gage of 3 ft. 7½ in. and was operated by horses. This line was changed into a standard gage road when locomotive traction was introduced. In 1872 and 1873 there were some local standard gage lines built by a special Austro-Hungarian company in connection with the State railroads, as well as in connection with the Hungarian State railroads.

The standard gage has been adopted for the local roads situated in the vast fertile plains, partly because the old rolling stock on the through lines can be utilized there. During 1893 the development of local roads in Hungary took a new leap in advance; some of the local lines already existing were still further developed and this activity has even extended into the present year. Electric railroads are also receiving attention.

## Compressed Air in Railroad Shops.

BY F. M. WILDER, C. E.

One of the big expenses in railroad shops is the cost of handling materials; and cranes, trolley runways, and lifts of many kinds have been devised to reduce this item of cost of work. Among the methods used pneumatic power has many advocates on account of the ease of its control, the various uses to which it can be put with little trouble, and its cheapness. In the shops of the Delaware, Lackawanna & Western at Buffalo, Mr. F. B. Griffith, Master Mechanic, pneumatic power is successfully and economically used. And some of the features and details in its use, there, are probably new to many of our readers.

The machine shop is about 110 ft. wide and 250 ft. long, to which additions have been made from time to time. Up to three years ago no special means had been used to handle heavy materials, with the exception of one hydraulic hoist, a derrick car and differential pulley blocks. In order to handle the materials about the shop a gang of seven or eight men was kept busy two-thirds of the time. Since the introduction of pneumatic hoists, cranes, etc., this gang has been dispensed with and much time is also saved by the regular shop hands in the ease and quickness with which they are able to handle such weights as cylinders, frames, driving wheels and other large pieces of machinery.

The plant consists of a receiver about 52 in. in diameter and 10 ft. long as a reservoir for the compressed air, with the necessary pumps and some 8 or 10 hoists. The hoists have pneumatic cylinders from 4 in. diameter and 4 ft. long to 13 in. diameter and 7 ft. long, suspended from trolleys, which latter run upon horizontal booms pivoted to swing. These cranes are located so as to serve several machines and as large a floor space as possible, some of them swinging through a complete circle and others through only a short segment of a circle, as the needs require. There are several other features, in addition to those already mentioned, which will be described later. The compressor first used was an ordinary Westinghouse compressing pump for air-brake service with 9-in. cylinders. The air cylinders were bushed down to 6 3-10 in. to get the required pressure in the receiver, as the steam supplied from the shop boilers was frequently below 60 lbs. pressure. Lines of piping were run from the reservoir through the different shops and tapped for use at convenient points desired. Since the plant was first planned it has been found necessary to add more pumping capacity and a Pedrick & Ayer air compressor has been put in use with capacity large enough to keep up the pressure of 110 lbs., even when several of the machines are in use at once.

The largest hoist, which is shown in the half-tone illustration, serves two driving wheel lathes, the wheel press, and a planer; the circle is 44 ft. in diameter. The line drawings, reproduced in figs. 1, 2, 3, 4 and 5, show details of its construction. This crane is equipped with a pneumatic motor for swinging the boom horizontally, and with a piston attached to pulleys for moving the trolley along the boom. The hoist cylinder is 13 in. in diameter and the lift is 5 ft. The three movements are controlled from one point by one man, who can, with this machine, take up a pair of driving wheels and put them into one of the lathes in one minute. The next largest hoist is in the main shop and has a swing of 40 ft. in diameter. This serves the large slotting machine, a large drill, a cold saw, and also covers a large floor space where the fitting up of cylinders, frames, etc. sheaves for moving the trolleys, are fitted with rollers. Another feature introduced is a mast derrick supported on a stone foundation in the yard. This derrick is a duplicate of those commonly used on a derrick car, and is equipped in the same way with gearing and chain. It is used to lift driving wheels and other large pieces of machinery from cars, also in handling car bodies and for removing or setting tires. Without changing any of the usual gearing (excepting the substitution of a large sheave in place of the small one at the end of the boom) a pneumatic cylinder 13 in. in diameter by 7 ft. long was applied to the under side of the boom, and a wire rope from the piston was passed over the sheave in place of the chain. This leaves the derrick so that it can be used by either hand power or pneumatic pressure as the case may require.

In order to connect the air pressure to the cylinder a pipe was run underground to the foot of the derrick; thence up through the mast and out at its top, in the center; here it is united by a swivel joint to a pipe connecting with the air cylinder at both ends. The piston rod passes through the cylinder, which has a packing gland at each end. This is necessary as the piston is pushed back or forward to raise or lower the weights, and each end of the piston rod is attached to the wire rope. The 7-ft. movement of the piston is ample to take a pair of wheels out of a gondola car and set them on the ground; this can be done by one operator.

The arrangement of the shop makes it necessary to carry large loads, such as driving wheels, trucks, etc., down the shop nearly 150 ft. from the main track. This is done by an overhead trolley from which is suspended

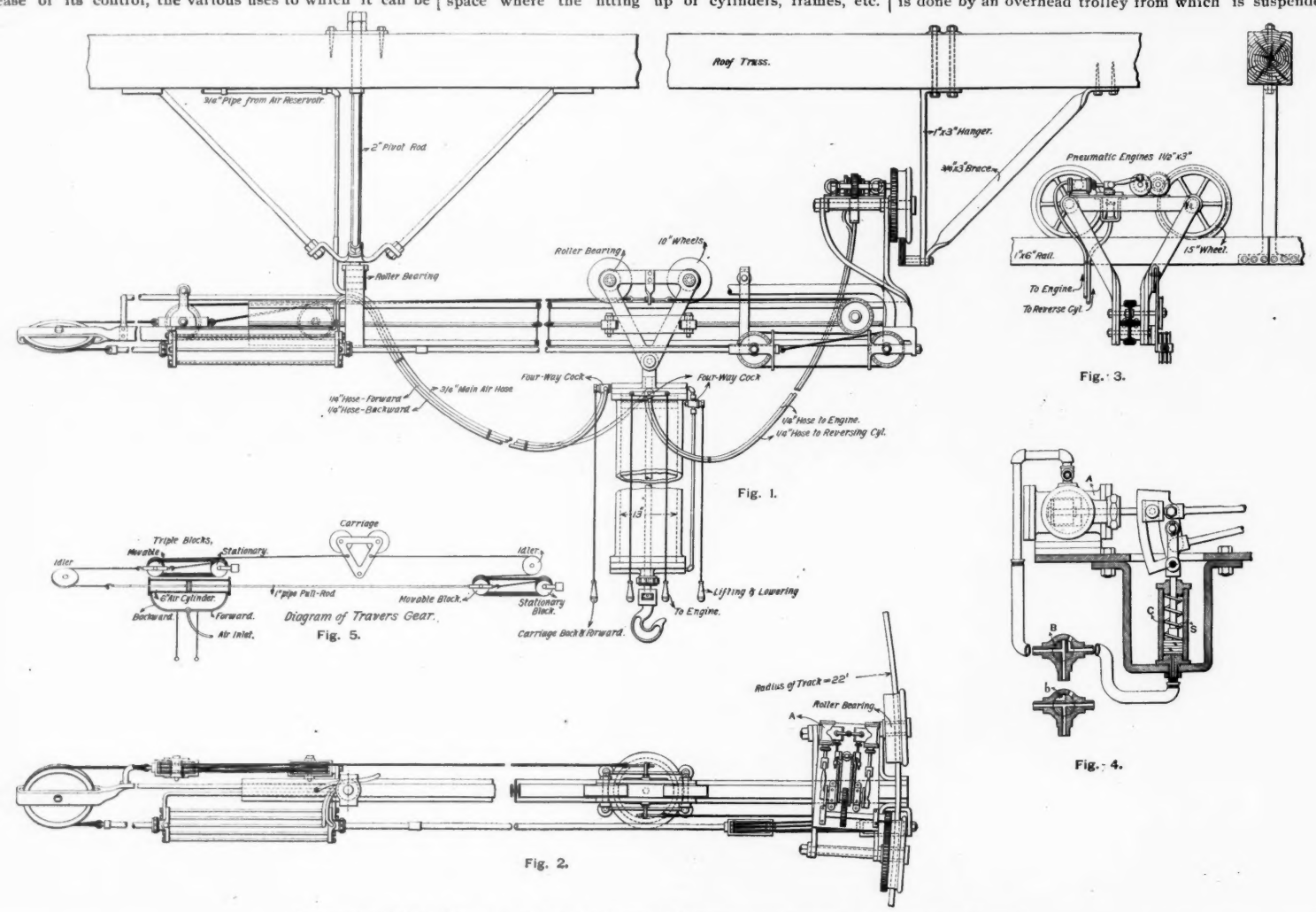



Fig. 1.

Diagram of Travers Gear.
Fig. 5.

Fig. 2.

Fig. 3.




Fig. 4.

Pneumatic Radial Crane, East Buffalo Shops, Delaware, Lackawanna & Western Railroad.

The motor for swinging the boom consists of a small double cylinder engine, *A*, the motive power being air. The reversing gear is operated by the same valve, *B*, that is used for starting the engines. Figure 4 shows this valve in the two positions which cause the boom to swing to either side. When the valve is open, as shown at *b*, the air goes to both the engine and the reversing cylinder, *C*. An eighth turn of the valve from this position shuts off the supply entirely; while a quarter turn, into the position shown at *B*, admits air to the engine but blocks the passage to the reversing cylinder and opens the exhaust therefrom. The links are brought down by the spring, *S*, thus reversing the engine. An ordinary four-way valve is used in connection with the hoisting cylinders and another for moving the trolley horizontally on the boom. The connections to and from the valves and cylinders are made with ¼-in. hose. All the bearings, including those of the pulley can be done. Another hoist serves six machines, viz.: three large planers, a radial drill, a common drill, and a punching machine. Other hoists are distributed about the shops.

These cranes are all on the radial plan and all are supported at the center bearing on rollers, the king bolt being stayed laterally. The outer end of the boom is carried by a trolley running on a rail supported by brackets. The details are all shown clearly in the engraving.

an hydraulic lifting jack. It used to be necessary to call several men to push this load along to the place required. But this is now done by another air piston, 15 ft. long and 8 in. in diameter, geared with pulley wheels, which moves this large trolley along its track much in the same manner as the trolley is moved on the boom of the crane shown in the cuts, figs. 1, 2 and 5. In this case the movement of the piston rods, in and out, is compounded 10 times by the pulleys; thus the trolley is run the 150 ft. with the piston movement of 15 ft.

Another use of air pressure is made in the oil house, where the oil is stored in iron tanks in the cellar and is forced up into the oil room by the air pressure; here the pressure is about 15 lbs. to the square inch. When a supply of oil is received, the air pressure is taken off, the pipes from the outside are attached to the tank and the oil emptied into a vat having a screen in the bottom through which it runs into the tank. If the oil comes in bulk it is drawn off in the same way from the tank car.

At the car shop, Mr. Griffith has also erected a plant and is now engaged in putting in pneumatic jacks for handling car bodies, etc. He has also put in a plant for the repair of air-brake fixtures, testing them, etc.

The application of the pneumatic cylinder to the mast derrick has suggested the application of its use in a similar manner to the derrick cars used for wrecking purposes, as a steam supply could always be had from the locomotive engine to run the air pump. The results ob-

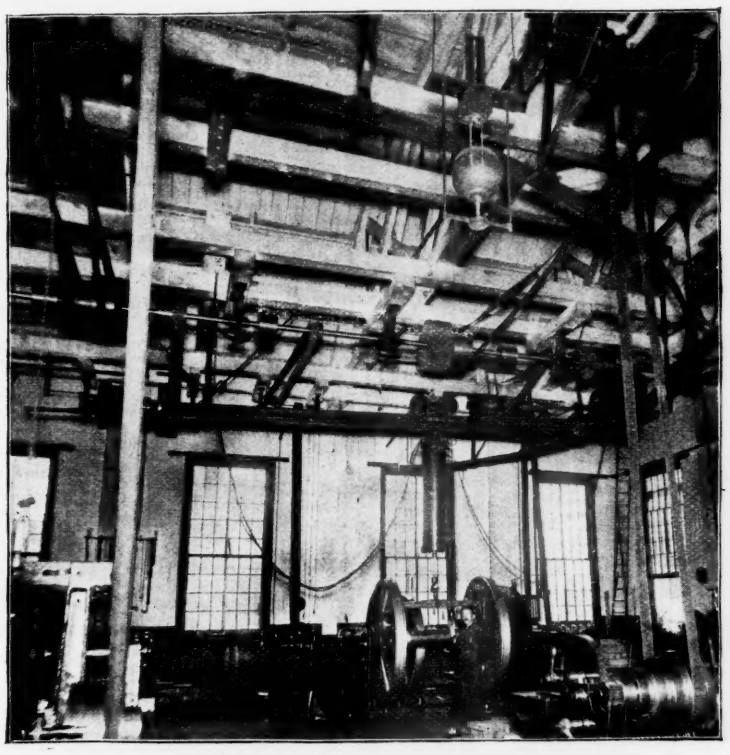
tained from the introduction of these cranes in this shop seem to justify a more extensive application of the system to all branches of mechanical shops where large weights have to be handled.

The cost for the entire system in use at these shops would be about $4,000 and it saves in labor not less than $2,000 per year; while the indirect saving must be double that amount.

## Employees' Tickets in England.

For some years past "privilege" tickets at one quarter of the ordinary fare have been granted by English railroad companies to their employees over their own lines.* About a year ago under pressure mainly from a body formed among railroad servants called the Privilege Ticket League, several companies made arrangements for the interchange of these tickets, so that the employees of one company could travel at the reduced rate over the lines of another and vice versa. These arrangements were made without any general attempt at concerted action.

Now 13 English companies, including the Great Northern (which has been the prime mover in the matter), the



Pneumatic Radial Crane—Delaware, Lackawanna & Western Railroad.

North Western, the South Western, the Great Eastern and the North Eastern, have agreed immediately, i. e., from Nov. 1, to make arrangements by which a general interchange of third-class privilege return tickets will be carried out over their lines, while three other companies, including the Midland and the London, Brighton & South Coast, have agreed to come into the agreement at the beginning of 1895. The only large English company standing out is the Great Western, which, of course, is an important exception because it is the longest English line; but the adhesion of this company is hoped for before long, as is also the co-operation of the Scotch and Irish lines.

Naturally, the working out of so extensive a scheme has met many practical difficulties, and in case any attempt should be made to carry any arrangements of a similar nature into effect in America, it may be useful to describe the working of the English scheme in some detail. It must be remembered that it has not yet been put to the test of actual use, and it is probable that some modifications will be found advisable.

The privilege tickets are issued at a quarter fare, that is to say, the fare for a third-class privilege return ticket (which is their invariable character) is one-half the ordinary single journey fare, or roughly speaking, one-fourth of a penny per mile, say one-half a cent, but no ticket will be issued for less than 3d. The tickets are granted not only to employees, but to their wives and such of their children as are living with and dependent on them, and children under 15 years of age are charged half-price —minimum 1½d. An employee desiring to buy one of these tickets must in each case get an order from or through his superior officer, and the power to issue orders is strictly limited to the chief officers of the companies, such as the General Manager, Secretary, Superintendent of the Line, etc., and to the District Superintendents in the various departments. The order bears the recipient's name and it is delivered up when he buys the ticket.

In the great majority of cases the applicant can buy at the booking office a ticket for the whole of his journey, no matter on what line the place of destination be; provided, of course, that no part of the journey is over the rails of any company not a party to the agreement. In cases where no "ordinary through bookings" are in operation, or where no through fare is quoted on the booking clerk's schedule, the clerk is directed to issue two or more orders available to or from the junction or point of interchange with each company; or he may issue a ticket to the nearest station to which he has a through fare (either short of or beyond the point of destination), endorsing the order accordingly.

In London and other places, where there are two or more railroad stations, it will often happen that an employee wishes to start his journey from a station other than that belonging to the company whose servant he is. Moreover, it is not an uncommon thing for English railroads to employ men in places where they themselves have no passenger stations. To meet these cases it has been arranged that where two or more companies, parties to the interchange arrangement, have separate stations or employ staff, privilege ticket orders issued by any one of the companies will be recognized and acted upon at the booking offices of the other companies.

In all cases of journeys over two or more companies' lines the division of the money received in fares will be carried out in the ordinary way by the Railway Clearing House. The prevention of forgery and fraud has been, of course, another *crux* in drawing up the scheme. Seeing that booking-clerks will often have to act upon orders signed by officers of other companies, it will not, of course, be always possible for these to verify signatures, even roughly, before issuing the tickets. But every day these orders are to be sent up with other returns to the head offices of the company issuing the tickets, and, as in the case of free passes, every effort will be made to forward the orders as promptly as possible to the officer who granted them. As perhaps their greatest safeguard, however, the companies rely on the co-operation of their staff to prevent abuse of a privilege which is for the benefit of all. A peculiar detail of the arrangements, which it will be interesting to know if ticket collectors carry out, is that tickets for women are to be "nipped" on the upper instead of the lower edge of the ticket.

To prevent overcrowding and other incovenience to full-paying passengers, several companies, who have joined in the undertaking, have stipulated that the privilege tickets shall not be available on public holidays and other specially busy days, when indeed popular excursions at reduced fares are general, nor by their most popular and luxurious express trains. In ordinary long distance trains (for which the tickets will, it is supposed, be chiefly used) it is anticipated that there will be generally found plenty of room for the additional passengers which the privilege will attract. Thus the companies look for no additional expense from the move, except, perhaps, in the reinforcement of booking-clerks, while some gain in revenue is expected, as most of those who will use the tickets would probably not travel at all if they had to pay full fare. Even if it entails some pecuniary loss, however, managers generally think that a concession of this kind, like money voted to pension and provident funds, brings in a good return in good feeling between employers and employed, and in attracting men of steady character to railroad service. C. H. G.

LONDON, Oct. 31.

*The American reader should bear in mind that railroad employees in England do not get many free passes. As a rule we believe, few free passes are granted to them except on the annual holidays, though in country districts special "market passes" are issued, which enable employees and their wives to travel every week free from the station where they are located to the market town of the district andback again. The special feature of this new system of privilege tickets is thatit enables employees and their families to travel at any time at reduced rates. This will probably not inter fere with the enjoyment of the free passes as already granted.

## The Mockridge Freight Checking Apparatus.

Mr. Mockridge, Freight Agent of the Lehigh Valley Railroad at Pier 56, New York City, has in use a simple and expeditious arrangement for insuring correctness in loading freight, which deserves the attention of freight agents. The distinctive feature of the arrangement is a series of numbering machines in a frame (shown in the accompanying engraving) by which the work of checking packages into a car is so easily and quickly performed that it can always be done thoroughly, however hurried the checker may be.

The machine consists of a consecutive numbering wheel, the dies being carried on its periphery; a second wheel carrying a shorter series of numbers, for stamping the car number, and a third wheel which is a hand wheel for operating the others. The machine is placed in the hands of the checker near the scales over which outward freight is trucked. By its use the man in charge can print on the duplicate shipping receipt or bill of lading a consecutive number for each package represented on that bill, and by the same operation (pressure on a treadle) the same number on a small ticket, which is given to the truckman who takes the goods into the car.

The method of operation may be illustrated by the following example: A shipping receipt calls for two bales of dry goods, numbers 23 and 24. On checking or weighing these bales the attendant stamps on the receipt as follows: (the figures 23 and 24 being already written in):

| | | |
|---|---|---|
| *23* | **10** | 2153 |
| *24* | **10** | 2154 |

The machine process would be the same for two packages not bearing any number. At the same time the machine prints the same numbers on a small ticket, thus:

| | |
|---|---|
| **10** | 2153 |
| **10** | 2154 |

This ticket is given to the truckman, who carries it, with the goods, to the loader; the latter sees that he has as many packages as the ticket calls for—there being a number for each package—and that the right car number (10) is shown. He then takes the ticket, punches it, and drops it into a locked box which is hung on the outside of the car near the door. This box is numbered 10 in conspicuous figures. The tickets are examined as the man enters the car, and if he should present a ticket numbered 10 at car No. 5 the error would be pretty sure to be discovered. If the loader makes a mistake and accepts a wrong ticket the punch mark will identify him.

It will be observed that for the car number the machine prints a short series of numbers in large type. These numbers are assigned to the cars which are placed at the platform at the beginning of the day, and a sheet for the checker and the way bill clerk is made out after the following fashion:

| DEPOT CAR NO. | CAR. NO. | DESTINATION. |
|---|---|---|
| 1 | N.Y.C. 7062 | Albany. |
| 2 | L.S. & M. S., D.6060 | Syracuse. |
| 3 | R. L. 18091 | Rochester. |
| ..... | ..... | ..... |
| 10 | B. L. 19345 | Chicago. |

Thus the conspicuous car number (in this instance 10) makes it easy for all concerned to detect errors. When a car is loaded the box is taken off and carried to the office, where it is unlocked and the tickets examined.

Mr. Mockridge has had this apparatus in use for about a year, and claims, apparently with much reason, that it insures much greater accuracy than can be secured by any other plan. The essential feature of the saving in

time, is, in addition to the superior accuracy of machine work, that the checker is never tempted to shirk or abridge his work because he is not able to keep up with the truckmen, as is often the case where many figures have to be made with a pencil.

The plan is also applicable at transfer stations, where way bills would take the place of shipping receipts.

### The American Economy Car Door.

The accompanying illustrations show a new car door which has recently been placed upon the market by the American Car Door Co., of Indianapolis, under the name of the "Economy" car door. It is of the projecting type, and the explanation given by the company for so devising it is that the door is for the benefit of those railroads and other companies using cars which are not yet ready for a flush car door. It will be observed from the illustration, which shows the door in position and the parts in detail, that this is one of the simplest of car doors.

Referring to the engraving, fig. 1, which shows the door in position: There are two rails on which the weight of door is carried; the left side of the door is supported by the hanger in the upper left corner; the right side of the door is supported by the rail, which is at the middle of the door. The upper hanger slides on the upper rail, but the support on the middle rail is a roller. The roller and its case are shown in figs. 2 and 3, and the elevation of the door shows the four bolts that secure the roller case to the door. The roller is a plain disc, but the case projects over both sides of the rail and prevents motion laterally with respect to the car. There are needed to complete the list of parts, only the holder, or guide, at the left side and the lock at lower right side. The door is made secure against malicious removal; it cannot be raised from the middle rail because the upper end of the door is behind the upper rail and the spacing block prevents the door from being raised, nor can the hanger be raised from the upper rail.

The motion of the door is extremely easy because one-half of the weight is caried on the roller. Its simplicity and adaptability, it is readily applied to either new or old cars, will commend it to many. The door has been on the market about eight months and has been put on a number of cars, in some cases replacing a flush door.

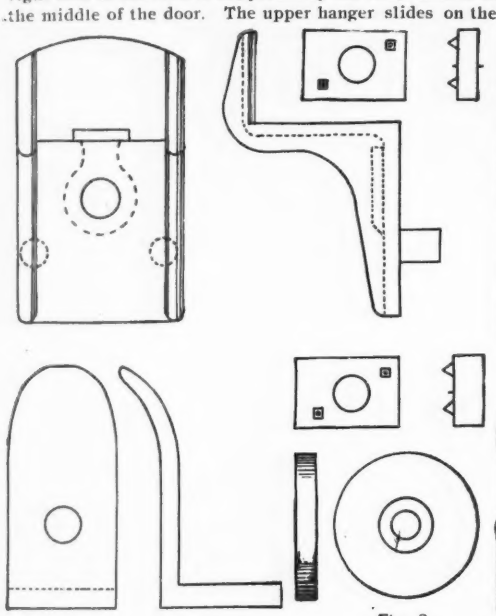


Fig. 3.

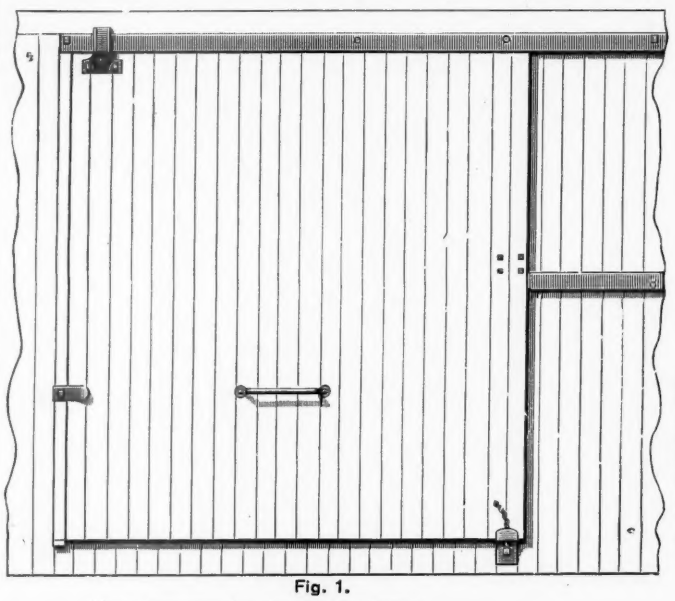


Fig. 1.

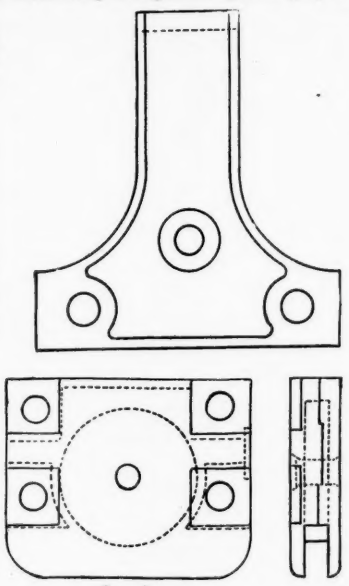


Fig. 2.

**The Economy Car Door, with Details.**

*Only those details are numbered which are particularly mentioned in text*

### Revision of the Interchange Rules.

At the December meeting of the Western Railway Club a communication was received from the Southern & Southwestern Railroad Club stating that at the November meeting of the latter club the following resolution had been passed:

*Resolved*, That the secretary be instructed to communicate with the secretary of all the railroad clubs, with request that they urge the executive committee of their clubs to appoint a Committee on Revision of Rules at once, with instructions to communicate to their secretaries not later than April 1, 1895, the result of their labor, and that the secretaries be then requested or instructed to send the recommendations of each Revision Committee to each other club for discussion at their following meeting. The object of this resolution is to bring about, if possible, recommendations before the Arbitration Committee that will be more uniform in purpose and expression from the different clubs than has heretofore been the case.

The Southern Club expressed a hope that the Western Club would see the advantages of the course indicated, and that at the next annual convention the changes recommended would be what every club, after careful consideration could present for the general benefit of the service.

The Western Club disposed of the matter by passing a motion to the effect that the Secretary of the Western Railway Club should send a notice to the other clubs, recommending that a committee in each be appointed to report at the February meeting on the Rules of Interchange, the same to be discussed in the April meeting; and that the Western Club would take such action and recommend other clubs to do the same, so that all could have the printed proceedings a sufficient time prior to the Master Car Builders' meeting to digest the whole matter thoroughly. President Gibbs of the Western Club subsequently appointed the following committee in accordance with the motion, viz.: J. N. Barr, G. W. Rhodes, C. A. Schroyer.

### The Congo Railroad.

The Congo River is navigable for steamers of deep draft only as far as Matadi, about 80 miles from the coast. From that point to Stanley Pool, 270 miles, navigation is interrupted by numerous cataracts. The Congo Railroad is projected from Matadi to Stanley Pool, and 25 miles have already been completed.

Soon after Leopold II. of Belgium assumed control of the Congo Free State in 1885, the project of building a railroad was discussed and soon plans for its construction began to assume definite shape. The sum of £400,000 was subscribed by the Belgian government, the remaining capital being supplied by the company, which is managed by Belgians.

The lower terminus of the railroad is at Matadi. Thence it crosses the Leopold Ravine to the Congo, where the road gradually rises to a height of 197 ft. above the sea. A few miles further on the railroad crosses the M'Pozo River by an iron bridge 200 ft. long. Up to this point the construction work has been very difficult, there being numerous cuts through hard rock. The road then crosses the Kimueza River to Kengé about 25 miles from Matadi, to which point it has already been completed. This 25-mile section is the heaviest on the road, the work requiring some 200 culverts and the building of 26 bridges, and costing about £29,000 per mile. It is expected that the total cost will be about £1,000,000. Rails weighing 47 lbs. to the yard are used, and metal ties weighing 50 lbs. are also used. There are some deposits of copper and iron along the route, but as yet the mineral resources of the country have not been much explored. The gage is 29½ in., with curves of 164 ft. radius. The operating expenses for the first year are estimated at £48,000 and the receipts at £103,200. These figures are based on a service of two trains each way a week.

The locomotives have six driving wheels, the diameter being 2 ft. 8⅝ in. The grate surface is 13 sq. ft. The weight of the locomotive in full working order is about 32 tons, and it will haul a load of 50 tons at an average rate of 25 miles an hour. It was necessary to place the fire-box above the wheels, as the narrowness of the permanent way did not permit of it being placed between the wheels.

On account of the heavy curves it was thought necessary to make the cars of a special design to prevent them being overturned by wind storms. The center of gravity was therefore placed as low as possible. The frames are of metal and have a double lining of teakwood. The seats are of perforated cane. In order to provide better ventilation the floors have perforated iron slides.

### The Conneaut and Port Dover Car Ferry.

A company has been organized with the title of The United States and Ontario Steam Navigation Co., to conduct the business of transferring cars between the Pittsburgh, Shenango & Lake Erie Railroad and the Grand Trunk of Canada. The capital is $350,000. A. C. Huidekoper, Vice-President of the Pittsburgh, Shenango & Lake Erie, is President of the new company. The Craig Shipbuilding Co., of Toledo, O, the builders of the Ann Arbor ferry boats, will build two wooden boats with capacity for 26 freight cars. Like the car ferries on Lake Michigan, the boats will have engines and screws in both the stern and bow; but the specifications for the machinery are not yet decided.

This line has been under consideration for some time, but has been delayed for financial reasons. But the capital is now provided and a tripartite contract has been made between the American and Canadian roads and the navigation company. The exclusive rights held by the Grand Trunk in the harbor of Dover are to be given up to the new company for 20 years, and the Grand Trunk is to spend $50,000 for terminal facilities. The principal business of the new company will be carrying coal from Pennsylvania to Ontario, and they hope to handle 500,000 tons a year, or about one-third of the present consumption of the Province, as the ferry route is claimed to be 82 miles shorter to Hamilton, Ont., than any other route. At the projected speed of 12 miles per hour, it is expected that each boat will cover the distance between Conneaut and Port Dover, 50 miles, three times a day, or that the two boats will make three round trips, carrying 26 cars with average loads of 25 tons.

Car ferries, transferring trains, are somewhat fashionnow. The Italians are arranging for one between Reggio and Messina that will connect the railroad system of Sicily with that of the mainland.

### Substructures.

Under the above laconic heading appears in the December issue of the *Polytechnic*, a report in full of a lecture delivered by Mr. George S. Morison, at the Rensselae Polytechnic Institute, on the evening of Nov. 27. The whole address is interesting to engineers grown gray in practice, as well as to students; but we shall reproduce here only a few extracts, advising the reader to read the full text as published in the *Polytechnic*.

First of all, let us consider what an engineer is. For many years I have liked to use a definition which was suggested to me long ago by a man who, beginning with small education, but with great executive capacity, carried through important public works under peculiar difficulties, and though never considering himself a scientific engineer, became one of the most successful railroad managers of his day. He told me that the business of an engineer was to build tools, and this is the definition I would use. . . .

The fundamental duty of the engineer is to get as good work as he fairly can; his only source of profit must be the salary or fee which he receives from his employer; his object must be the best result. The contractor on the other hand has a personal pecuniary interest; the more cheaply he can do his work the greater his profit will be; he is under a constant temptation to make his profits as large as he can. The general tendency of all engineering work is to improve and to cheapen the products; in other words, every new tool made, by increasing the capacity of production, tends to make better products and to make the cost less. . . . The fact still remains that the responsibility for the continual improvement which we look for lies principally with the engineer.

The first duty of a bridge pier is to carry the weight above it; it must, therefore, be sufficiently strong to carry this weight, and it must rest on a foundation which will safely support both the pier and the weight which that pier carries. . . . We will look on foundations simply as provisions to carry weight and to resist vertical forces only.

Foundations on compressible soil are generally handled in one of two ways, either by distributing the weight over a large top surface or by distributing it through a considerable depth of the compressible material. The former practice is now being used very largely in Chicago, where the largest buildings in the city are supported on broad platforms, the size of which is determined by the weight on each separate piece. . . .

Where this system of foundations is applied to buildings of irregular shape, with high towers or large interior halls, very irregular settlement is sure to occur. In one building which I have had occasion to examine critically, the total settlement has varied from a minimum of five inches to a maximum of eighteen inches, in some instances there being a difference of nearly seven and one-quarter inches between adjacent piers; such a result is of course horrible.

In speaking of this class of foundations on compressible soil it is perhaps right to refer to what is now the usual parctice in Chicago, though it is not necessarily a feature of this class of foundations. The old practice was to use timber platforms or to spread out the area of the base with masonry. The present practice among builders in Chicago is to use platforms made of I beams bedded in concrete; the I beams give the necessary rigidity. . . . The object of using I beams in this way is not to distribute weight so much as to save space. The same weight could be distributed by brick piers or masonry piers, but in Chicago there are objections to deep excavations; they try to save space for a basement. If they used simply a

block of masonry that space would be lost. There is a method which has not been used there, which seems to me offers considerable advantages if someone will try it, and that is to give up the I beams and substitute for the I beams buried in concrete, a concrete block of the same size with simple steel bars buried in the lower portion.

The other method, that which distributes the pressure over a considerable vertical distance instead of a horizontal surface, has some decided advantages. The usual method of accomplishing this result is by driving piles, and this duty is what has generally been recognized as the proper function of piles. For bridges they are practically the only foundation which can be used on really compressible soil, as settlement is always objectionable in a bridge substructure, and the flow of water is likely to produce local disturbances, which at any time would revive such settlement.

A single striking exception, however, to this rule may be properly noted—the bridge which carries the New York Central Railroad across the Seneca river consists of a series of small stone piers, carrying spans only twenty feet long, all resting on a single timber platform extending completely across the river and bearing on the soft compressible soil. This structure fulfilled its purpose so well that when the four-track system was completed twenty years ago a structure precisely like the old one was built to carry the two new tracks. When the West Shore Railroad was built ten years later another structure of the same class was built to carry its two tracks. This, however, is an exceptional structure. In general the problem which the bridge engineer has before him is either to carry his fouration down through the compressible or unsafe soil to something which can be depended on below, or to make that foundation safe in the uncertain soil.

Occasionally he is relieved from both of these problems and can found his piers directly on safe material with little expense for the foundations. One of the most remarkable instances of this kind is the bridge across the Ohio River at Louisville, Ky. This bridge, which crosses at the Falls, is a mile long, and the piers are founded on the solid rock bed of the river, many of them being built in position during the low water season on dry rock of stone quarried from the bed of the river, laid up in cement made from rock also quarried out of the same bed. . . . The first bridge built across the Mississippi River was at Rock Island. Here the solid rock bottom was found only a short distance below the water and the piers were placed on this rock.

The upper Mississippi is totally unlike the Mississippi below the mouth of the Missouri. It is a river with a comparatively small fall. It comes from small lakes, its current is moderate and its bed is a heavy sand, and it is in no proper sense a silt-bearing river like the Missouri. The Missouri is a silt-bearing river, and the same conditions are met in handling the Missouri and Mississippi below the Missouri that are met in any silt-bearing river like the Nile, the Ganges or the Chinese rivers.

The silt bottom of a silt-bearing river is usually so fine that when there is any considerable current it washes out to be again replaced during the low water season. There is one place in the Missouri River where I had a striking illustration of this. For two or three years the water was regularly about eleven feet deep in January and about fifty feet deep in July, the water in July not being ten feet higher than in January. It was the regular action of a silt-bearing river; the strong current of the summer flood washed the bottom; then the river began to fall and this continued until it fell to low water, but when it reached low water level the discharge was three times the low water discharge; then it began to fill up the bottom and continued this filling till the cross section was reduced to that required for the low water discharge; then it rested until another flood came.

The second bridge across the Mississippi was at Clinton, Iowa, where the smaller piers were founded on piles, but the draw pier which had to be placed in deep water was founded on a timber crib 400 feet long, which formed a protection for the draw when opened, the pier standing in the middle of this great crib. In 1867 two bridges were begun across this river—one at Burlington and one at Quincy. At Burlington all the piers but one and at Quincy all the piers but two were founded on piles. The bed of the river was excavated by different processes at the two bridges, so as to form hollows in which to drive the foundation piles, and these piles were driven with a simple drop hammer. When driven they were cut off at varying depths below low water by a circular saw, and the masonry built on a timber platform was lowered on top of the piles thus cut off, while the foundation was further protected by surrounding it with an island of riprap. This form of construction was very simple and effective. The bed of the Upper Mississippi is a coarse, heavy sand; the current is never extremely rapid; with moderate care a riprap protection can be maintained and the foundation kept permanently safe. One beauty of this form of foundation is the readiness with which it can be handled, all the work being done above water, no pumping being required. With little practical change it has been used for twenty-five years.

In the bridge at Alton, completed in the early part of this year, all the foundations are of this character. Instead of being driven with the simple drop hammer the piles were driven by a steam hammer and aided with a water jet, an appliance which while useless in clay facilitates such work enormously in sand. The piles were cut off ten feet below low water with a circular saw rigged to be handled in pile driving leads. The masonry was built in a floating tub, the bottom of which was a permanent timber grillage four feet thick, which distributes the weight over the piles, and the sides of which were removable and used successively on the several piers. When the pier was settled on the piles by admitting water into the tub and by laying masonry, its position was adjusted, and if necessary to remove it it was easily floated by pumping out the water in the curb or removing a few stones. When the foundations were finished they were heavily riprapped.

This form of foundation has been a standard American practice where rock or other permanent material is too far down to reach without unreasonable expense, and the action of the water sufficiently moderate for well riprapped pile foundations to be safe. In some instances it has been used where the piles were driven to rock which at flood times has been scoured clear, the piles being held in place simply by the riprap which surrounds them. This, however, is carrying the process beyond good practice.

Several things may make pile foundations inadmissable. . . . In these cases it is necessary to carry the solid foundation down to some safe bearing, either to bed rock or to some substantial soil. There are three principal methods of doing this work. The first is the coffer-dam, the details of which are various, but the general principle of which is always the same. The second is the system which has been used for centuries in India of sinking piers, which are there called wells, by dredging through the interior. The third is the well-known plenum pneumatic process.

Of the coffer-dam I shall have little to say. The coffer-dam is simply a dam which surrounds the work and excludes water so that on the completion of the dam the interior can be pumped out and the excavation made to the desired depth in open air. The dam may either be a solid timber wall which, if it completely surrounds the foundation, is more properly called a curb; or a double wall with the space between the two wells puddled with clay or gravel, or it may be any one of a great variety of designs. The fundamental principle is that the dam must be strong enough to resist the outward pressure and tight enough to keep the limits of leakage within the capacity of the pumps. For moderate depths the coffer-dam is usually the cheapest and most desirable method. For great depths it becomes very expensive, and anyone who has been in a deep coffer-dam and noted not only the way in which the interior spaces are encumbered with bracing in all directions, but the constant leaks which unless attended to in time would lead to expensive disaster, recognizes the difficulties which attend this class of work.

The Indian method is of very early date. It was practiced by the Hindoos long before the English raj. As they used it a simple wooden shoe was laid on the ground and on this a circular brick wall was built; the earth was then excavated through a hole in the middle of the shoe, at first in the dry and afterwards by a bucket working under water. As the earth was excavated the well sank. It is very probable that this system was first applied to the actual construction of wells, and that its success there led to its adoption as a foundation method. When the English began their system of internal improvements in India they adopted this method of foundation. In their early works the piers were simply the old Hindoo wells on an enlarged scale. In time the round brick well gave place to piers of various shapes, and with more than one shaft in them and the simple wooden shoe became a complicated caisson.

The largest illustration of this kind of work is the Dufferin bridge across the Ganges at Benares. This bridge is a singular combination of the old and the new. Passengers crossing it see in the distance the crowd of pilgrims who have come to the sacred city of Benares to bathe in the holy Ganges. The abutments are finished as fortifications so that they can be garrisoned in case of rebellion. Their piers are of brick in shape of an ellipse, and were sunk by dredging through three different openings to an extreme depth 140.5 feet below low water and 190.5 feet below high water in the Ganges.

The foundations of the Poughkeepsie Bridge are really of this class, though the base is a timber cribwork filled with concrete. The Hawksbury Bridge in New South Wales is another illustration, the submerged part of each pier there is a thin iron shell filed with concrete.

The great advantage of this system is that all work is done above water, so that the cheapest class of labor can be employed. In fact it has many of the advantages which belong to the method of putting in pile foundations used on the Upper Mississippi. The masonry of the pier is laid in the air as the sinking proceeds.

The disadvantages of this method of founding lie in the fact that the actual work of excavation at the bottom is in an inaccessible place. At moderate depths divers can be set down to remedy any defects, but the work of divers is always expensive and almost always very unsatisfactory; it is hard to get good work when the workmen know that their work can never be inspected. Where the material is loose and flows naturally to the dredges this method can be carried out with perfectly satisfactory results, but in a hard stiff clay the difficulties become great, and when no satisfactory soil is found above bed rock it is very hard to get satisfactory connection between a foundation put in in this way and the rock itself.

In sinking the deepest foundation of the Dufferin Bridge an accident occurred of a peculiar character which illustrates one of the risks attending this method of work. Through some local irregularities the pier became hung up, as the term is, and the digger worked down some twenty feet or so below the cutting edge; suddenly the meterial around the hole which was thus dug fell in, and this material rushing in forced up the water in the wells to a corresponding height above the surface of the river; this caused an internal pressure which actually burst the pier, a large piece of the brick masonry being broken off from one side. Work on this foundation had to be abandoned till after the next high water season, and when that high water season was over no trace could be found of the great piece of masonry which was broken out; it had settled into the loose sand of the silt-bearing Ganges. The break was repaired by covering the hole with a great patch of iron and filling the interior with concrete. The pier is now as good as if no accident had happened, and the story is told simply to show the kind of risks that are incurred in working in inacessible places.

In the building of the bridge across the Missouri River at Kansas City in 1868 one foundation was sunk in this way. Everything worked better than was expected until a layer of boulders was reached which overlaid the bed rock, then the dredges would no longer work and the pier would not sink. All the remaining work had to be done by divers, and though the result was entirely satisfactory it was enormously expensive.

The principles of the plenum-pneumatic process are well known to you and need not be described. The great advantage of this process is the perfect command which the engineer has over his work. The material is excavated by men working in the pneumatic chamber, which is accessible to every one who has any business to go there. The engineer always knows what he is doing. The disadvantage lies in the fact that the men have to work under an atmospheric pressure sufficient to balance the pressure of the surrounding water, and as the depths increase the work becomes extra hazardous. To how great a depth this kind of work can be carried has not yet been determined. It was formerly thought that eighty feet was about the maximum; at St. Louis men worked in 112 feet of water; at Memphis I have worked men in 108 feet of water; in neither instance were the sufferings of the men as great as at somewhat less depths where less precautions had been taken. With special precautions it is probable that this depth could be increased at least twenty-five feet, but whenever it is done, it will undoubtedly at first be attended with many fatalities. Pressure work, as it is commonly called, is like all other work which involves special exposure. If proper precautions are taken and the men take care of themselves the risk is comparatively small, but men of dissipated habits, who expend their energies elsewhere, also suffer in extra trying work, On one piece of work we always noticed that when there was a ball in town the number of pressure men attacked with "the bend" was very much augmented. . . .

The plenum-pneumatic process is simply an enlargement of the diving bell, and as originally applied was quite a simple affair. A cast iron cylinder called a pneumatic pile formed at once the working chamber and a section of the pier itself; the air lock was placed on top and moved from time to time as the sinking proceeded, and the material excavated was put in bags and passed out through the air lock. The earliest pneumatic work done in this country was of this kind. The iron cylinders of the Pedee Bridge in North Carolina were put down in this way, and when the war broke out the piers of a bridge across the Savannah River on the Charleston & Savannah Railroad were building. This work was never completed.

In 1855 the younger Brunel, who was perhaps the most remarkable engineering genius of his day, applied this process to a caisson for the central pier of the Saltash Bridge which was sunk to a depth of 87.5 feet. One of the earlier developments of the caisson principle was in the bridge across the Rhine at Kehl, built in 1859, and where dredges working in the wells full of water were used to handle the material which was fed into the dredges by the men.

The first application of this process to a work of large size in America was at St. Louis.

The history of the St. Louis foundations is remarkable as illustrating at once the great ability of Captain Eads, the engineer of that work, and the way in which an engineer who has never had a thorough engineering education is likely to go astray. Captain Eads had never built a bridge. He had built gun boats and had had a large and successful experience in wrecking on the Mississippi River. He wished to build this bridge largely as a matter of personal ambition, as it was the first bridge across the real Mississippi. He worked up a foundation plan which was published in a blue pamphlet issued in 1866 or 1867. He proposed to build a wrought iron curb large enough to enclose an entire pier, to take this curb out to the site of the pier and sink it by sand-pumps working inside; as the sand was pumped out he expected the curb to sink until it reached bed rock, which was about eighty feet below low water at the site of the pier. When the curb reached the rock he proposed to build a boat inside the curb, with a heavy bottom, and in this boat to build his masonry; as the weight of the masonry increased, the boat would gradually sink until the masonry grounded on the bed rock of the river. The building of the masonry would then continue until above water; then he would take hold of his curb with screws and tightening up on these screws, pull the curb out and use it for the foundation of another pier. It was a bold idea, but one which would have been very difficult to execute. The friction due to the pressure of the sand on the outside of the curb was not realized, and the amount of sand excavated would have greatly exceeded the volume of the curb. Had he sunk his pier, it would have been very difficult to get a satisfactory bearing on the rock bottom; when he tried to pull out his curb, it would have pulled to pieces before it would have moved

Before the work was begun Captain Eads went to Europe, partly on account of his health and partly to study foundation work there. During his absence the foundation plans were entirely revised by Colonel Flad, and put in shape, which made them very much more practicable. A circular curb with heavy thick walls was substituted for the oblong curb, and in this curb a foundation of concrete blocks was to be laid, on which the pier was to be sunk, while only the upper section of the curb was to be removed and used on the second pier. Captain Eads returned during the winter of 1869-'70. I called at his office a very short time after his return. He then showed me the plans for his foundations, and these plans resembled the earlier plans, only in the shape of the masonry above water. He had worked out complete plans of the pneumatic caissons which he was to use and in the very short time which had passed since his return had them already under contract. He had abandoned his curb, his floating tub and his whole method of excavation; having seen what the pneumatic process really was, he had adopted it at once, making those changes which he thought desirable. The absolute completeness of his change of plan and the rapidity with which he executed the new plan form one of the most remarkable instances of executive ability I have ever came across; it showed where the great engineer came in. If he had had the engineering education which you can get now he would never have done anything else.

At this work three radical changes were made which Captain Eads always regarded as original.

The first of these was the position of the air lock which instead of being put on top was placed below the roof of the caisson and remained undisturbed during the whole sinking.

The second was the Eads sand pump which was used to excavate the sand and proved an exceedingly useful tool.

The third was the construction of a caisson of timber instead of iron, but this last, however, was applied only to one of the three principal caissons, and even then the caisson was rendered tight by a metallic lining.

The St. Louis Bridge was followed by the East River Bridge, the caissons of which were of materially different construction, being much more largely of wood while the material excavated was of a much harder character. In this work blasting was used in the caisson to a considerable degree and the sinking of the first caisson showed one of the dangers of wooden construction, the heavy timber roof accidently took fire and was only extinguished with great difficulty and after long delay. The danger of fire in a timber caisson is much greater than might at first be thought. It would seem as if a mass of timber fifty feet or more below the water was safe from destruction by fire, but it is hard to find a place where the danger is greater. The caisson is filled with compressed air, as the air pressure is balanced by the water pressure at the bottom of the caisson; at the roof of the caisson the water pressure is about three pounds less, but their pressure is the same; there is a constant tendency for the air to escape; no one ever saw a timber caisson which was not full of leaks and from one point of view these leaks are good as they constantly change the air and keep it fresh for the workmen; but the draught from every leak is outward and it is a draught of air which supplies abundant oxygen for combustion. In old times, when candles were used generally for light in caissons, a workman hearing a leak would put up his candle to see where it was and the first thing he new the escaping air would suck the flame into the leak, something inside would take fire and the constant blast of escaping air would fan this fire. I have several times had caissons take fire and there is but one thing to do when this occurs, call the men out of the caisson and let off the air pressure; then the caisson fills with water, the supply of air ceases and the fire goes out. As the intermission of the air pressure usually means a settlement of the pier and may sometimes give trouble there is always a temptation to try to put out the fire without letting the air off, but if a fire once fairly starts, the only proper course is to drown the work.

Timber caissons have now become the almost universal American practice. There are different plans of construction, I will show you presently the plan which I prefer. The caissons are usually lined with plank, and calked joints like those used to keep water out of a ship are used to keep air in the caisson. The form of caisson which I prefer uses somewhat less timber than some other forms and makes the upper portion a mass of concrete built in among timbers. The principal advantage of this is not

(*Continued on Page 11.*)

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## EDITORIAL ANNOUNCEMENTS.

**Contributions.**—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

**Advertisements.**—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

Locomotive building is shown to have fallen off tremendously in the past year, according to our reports of the output of the various contracting works. The decrease in the number built is fully two-thirds, as compared with the previous year. Reports from 13 companies make the total 695 locomotives for 1894, against 2,011 locomotives built in 1893. Three companies building nearly 90 locomotives in 1893, did not turn out a single new locomotive in 1894. Of course, when the general totals show such a great decrease, it is not to be expected that any one manufacturer would be fortunate enough to build anything like his previous year's work. As a matter of fact no one company built half as many locomotives in 1894 as in 1893, and only the smaller builders were able to keep within a third of the output recorded for 1894. It need hardly be added that these figures are unprecedented in locomotive building in the United States. Going back five years we get the following record of locomotives built in the United States: In 1894, 10 companies built 695 locomotives; (3 built none); in 1893, 14 built 2,011; in 1892, 13 built 2,012; in 1891, 13 built 2,165; in 1890, 15 built 2,300.

It is to be noted that over 80 locomotives of the total number built in 1894 were built for export.

The record of the car builders is even worse than that of the locomotive builders. In 1894, only 27 companies have reported as having built any freight cars, the output being 17,029 cars. In 1893, 51,216 freight cars were built by 43 companies. There were 15 important car building companies which did not turn out a single car in 1894, ten of these having built about 3,000 freight cars and over 300 passenger cars in 1893. Five companies built no cars in either of the last two years, but these companies built 3,318 freight cars in 1892 and 2,380 in 1891. Three other companies, which have gone out of business, built 3,925 cars in 1892 and 2,953 in 1891. As to passenger cars, the returns show that 510 cars were built by eight companies, against 1,980 built in 1893 by 14 companies. In 1892, over 93,000 freight cars were built by 18 companies in the United States; in 1891 the figures were over 95,000 cars by 50 companies, and in 1890, over 103,000 cars were built. A decrease in output of 34,000 cars in one year, and of over 86,000 cars in five years, tells its own story. But car builders and locomotive builders may still get some comfort from a study of past and present conditions. The 1894 demand was doubtless lessened by the fact that considerable equipment was built in anticipation of the great business of the World's Fair year, which turned out to be so disappointing. These builders of equipment were among the first of those industries depending largely for support upon the railroads, to feel the effect of the disastrous decline in railroad earnings. They may now hope to profit by the improving condition of railroad traffic and income; and, further, the car equipment of many of the railroads has been allowed to run down. It was not bad judgment to follow that policy. It was necessary; but "vacant numbers" will have to be filled soon, and it is not good railroading to keep in service worn-out cars, or cars on which the annual bills for repairs are a big percentage of their original cost. Car builders may not be able to get the prices for their cars which they would like to get, but the material which goes into building the cars is quoted at lower prices than ever before.

The conference committee on locomotive tests appointed at the last convention of the Master Mechanics Association, has issued a circular letter to General Managers and master mechanics and superintendents of motive power asking for a contribution of thirty cents for each locomotive owned. This is in line with the recommendation of the American Railway Association, before which the plan for shop tests of locomotives was brought some time ago. The objects of the tests are set forth in a four page circular containing a report of the committee which was appointed to make the tests; Messrs. Forsyth, Vogt, Gibbs, Barnes and Marshall. This report was summarized in our last issue, page 882. The circular letter of the conference committee contains the following, which is their explanation of the value of the proposed tests for which the contribution of thirty cents per locomotive is asked:

"You are, of course, aware that the road tests of locomotives, which all railways at one time or another undertake, are very expensive, and that they produce after all data, which are, to say the least, unsatisfactory. Shop tests conducted on the plan proposed have, on the other hand, proven to be of the highest value, for they produce accurate results, from which may be deduced exact conclusion; moreover, they will afford the much needed data at nominal cost."

This movement is one of great importance and the entire estimated cost, about $7,500 is only a small fraction of the large sum that has been spent in this country in the last five years for tests of compound locomotives and which have not yet given a conclusion of sufficient importance to settle definitely the limiting conditions under which compound locomotives may be used to advantage. A shop test is definite and accurate; a road test, except it be long continued, may give false conclusions owing to the impracticability of controlling the conditions of operation without hauling the same train to and fro over the same track a sufficient number of times to get a fair average. Up to this time it has been thought too expensive to give an opportunity to make these duplicate tests.

A Western paper notes the fact that on the line of the Cleveland, Cincinnati, Chicago & St. Louis road, between St. Louis and Cleveland there are now 27 grade crossings of other railroads at which the signals are interlocked, so that trains can pass the crossings without stopping; and that this makes it possible to run a train through in an hour and a quarter less time than would have been possible before such signals were provided. Two more crossings will soon be equipped, which must, we should think, take in pretty nearly the whole of the crossings on the line (no one not familiar with the road could think of making an accurate count, but common maps show about that number of intersecting railroads). This item is a reminder that America will not always be behind England in signaling, and that the Eastern States do not monopolize all the good signaling in America. Besides the saving in time the money saved by not stopping is probably something, and that factor counts with freight as well as passenger trains. We do not say, as did an enthusiastic mathematician once, regarding the Pittsburgh, Fort Wayne & Chicago, that this saving will be a large and definite sum yearly, for we might be answered, as he was, by the fact that the sum named was larger than the entire expenditures of the road for a year; but when we give full consideration to delays, which are often very costly on a single track road, and to the damage liable to result from broken couplings, which is a familiar annoyance on all roads, the avoidance of freight train stops will be found to be of real value in the long run, in spite of the impossibility of stating it in definite figures, and even omitting the saving in fuel. And the saving of a whole hour and more in a passenger run is of value not alone in enabling the management to run competitive trains or officers' specials at lightning speed; it also makes it possible often to avoid excessive speed. If a train has 14 hours in which to run from Cleveland to St. Louis, and make an important connection it can do it by running at 39 miles an hour with no stops, or at 40.6 miles an hour if it loses half an hour by 10 stops; while, if we add 20 more stops, estimating the loss at one hour, it is necessary to raise the average rate of speed while in motion to almost 44 miles an hour.

As far as fixed signals are concerned an engineman should train his mind to look for "all clear" rather than for danger signals. This sound principle was enunciated many years ago by clear-sighted railroad men, and it is now so well-known that everyone claims to appreciate its importance (when the subject is up for discussion) though in practice we often lapse back into the old habit of holding that a red light is the most important signal ever heard of. This principle is important to remember in considering the distant signal problem. It is also important as affecting every ordinary switch. The other night a passenger train on a trunk line ran over a misplaced switch and crased into some coal cars on a lonely side track, making a wreck that inspired the reporters to print a column of the details; and their reports stated that the switch had been maliciously turned, and the lamp taken off. The first suggestion of such a disaster is that (the road being double track) the side track ought to be entered from the other end; and the second is that, if there must be a facing point, the signal ought to be sufficiently distant to enable enginemen to know how the switch stands some time before they reach it. But the third lesson is not unimportant, and is the one especially brought to mind by this collision; we mean the point stated at the opening of this paragraph. We do not know that the engineman was at all negligent in this case, but it is a matter of common knowledge that mishaps of this kind are occurring every week in consequence of the generally prevalent habit of assuming (at night) that a switch is right unless the red light appears. The runners are not wholly to blame for this, for the requirement that they shall make time is often impressed upon them much more strongly than is the rule to make sure that every switch is right before passing it; in fact, this rule is often omitted in letter, as well as in spirit. But whoever is to blame, there can be no reasonable confidence—to say nothing of positive safety—in running fast passenger trains at night or in foggy weather, until this rule is prescribed and enforced; and to enforce it the distant signals must be provided and the principle referred to must be constantly inculcated.

### Rapid Transit in New York.

If there is one thing that the rapid transit matter in New York needs more than another it is light, and Mr. Parsons' report lets in a startling ray. Still more light will come, for it is apparent that the commissioners wish neither to live in a fool's paradise nor to humbug the people, and it is apparent that Mr. Parsons does not mean that they shall do either, if he can help it. The report that he submits makes the cost of the cheapest of the various plans suggested by him $60,000,000; but this is only for the actual construction of the railroad. To it must be added a pretty substantial sum for cars, motive power, signalling and all the minor expenses that must be incurred before the tracks will be of any use; and then we must add a large and entirely inestimable sum for damages to property.

But under the law the city can only spend $50,000,000 on the job. Obviously the two sets of conditions will have to be coördinated, and the commission has called together a board of experts to help in the coördination.

What the upshot will be, we shall not try to predict, but we feel reasonably safe in saying what it will not be. It will not be any such complete, commodious and altogether adequate system of rapid transit as the people of the city of New York are looking for, built under ground, for fifty millions of dollars. We have never had the slightest suspicion that such a thing was physically possible and we do not know of any engineers who have had. There are various possible compromises. It is possible to stay under ground and reduce the number of tracks, and guess again; or it may be possible to get above ground (of this we are not certain), and know precisely what the limits of costs will be. But we shall not attempt to anticipate the recommendations of the board of experts.

We observe a disposition on the part of some of the newspapers to twit Mr. Parsons with having changed his mind about the dimensions for his cars and tunnel; they might also twit him with having made a very radical change in the whole scheme of tunnel construction. But fortunately for the city, the Chief Engineer of the Commission is "not so old or bred so dull but he may learn," which is a blessed condition for any man to be in. We agree with him entirely in what he says about the importance of increasing the tunnel section above the sections that were used in the provisional plans. It is not worth while to reiterate the reasons; they are admirably stated in the report, which may be read on another page. We might add, however, that enough weight is not given in the report to the importance of having large cars, even under ground. The notion that a small car could be comfortable under ground, while a large car is necessary to comfort above ground, is one of the most singular of the many singular delusions which have haunted this whole rapid transit question. A man needs just as many cubic feet of space for comfort under ground as above ground, and in fact we should suppose that he needed more. The under ground cars to be comfortable, and to attract passengers must be large enough to make it possible to ventilate them; they must have the air of being commodious, and must be brightly lighted. We know of few things in the world more dismal than the inside of one of the little cars on the City and South London tunnel; they

are travelling sarcophagi. Of course if the people of the city of New York want to invest their money in a kind of railroad that cannot be made attractive and comfortable, that cannot draw to it passengers enough to pay, and that could not carry them, if it could get them, they have a perfect right to do so; but let there be no misunderstanding in the matter. The people ought not to be deluded into thinking that they are going to get a fairy chariot and be put off with an oxcart. That would not be agreeable in its final effects on he commissio ners.

### Another Air Brake Decision.

Those who are interested in air brake matters will remember that about two months ago the United States Circuit Court of Appeals rendered a decision in the case of the Westinghouse Air Brake Company against the New York Air Brake Company, sustaining a decision rendered some time before by the United States Circuit Court sitting in the Southern district of New York. These decisions effectually and completely enjoined the New York Air Brake Company from selling either of the triple valves which were in suit; and also established a presumption that a later form of triple valve brought out by the New York Air Brake Company, and the subject of still another suit, would also be found to infringe. This presumption has now become a fact. The last known triple valve of the New York Air Brake Company does, also, infringe the Westinghouse patents.

This last aspect of the matter we declined to dis uss, considering it something for the courts to settle. Nevertheless, the New York Air Brake Company issued a letter in which they said "it must follow that a valve such as the New York Air Brake Company has been making, since Judge Townsend's decision, operated by train pipe pressure, is by the Court of Appeals' decision, free and clear from the only patent, No. 376,837, sustained for the Westinghouse Company," and further, that letter said "the result to any fair-minded and intelligent person, conversant with air brakes, of a careful reading of the decision of the Court of Appeals will be to convince him that the present valve of the New York Air Brake Company is absolutely free from any of the patents which were involved in the case just decided. The New York Company is free to make it, and the railroads to use it." But suit had already been brought, as we have said above, for an injunction against this later form of valve, and a decision in that suit was rendered by Judge Lacombe, of the United States Circuit Court, Southern District of New York, on Thursday of last week.

This decision grants an injunction against the New York Air Brake Company which forbids the manufacture or sale of their later quick action apparatus, and from such information as we can obtain, we judge that the New York Company is now enjoined from making any one of the quick action air brake valves which it has offered for sale, or in any way made public as an apparatus suitable for the purposes for which an air brake is used.

In the earlier suits mentioned, No. 360,070 was not involved. In the suit in which the decision has now been rendered, injunction was asked for under this patent, namely, 360,070, granted to Westinghouse, March 29, 1887, also under No. 376,837, granted to Westinghouse January 24, 1888; and under 393,784, known as the Park patent, granted to Harvey S. Park, December 4, 1888. No. 360,070 is the first quick action air brake patent issued to Westinghouse. No. 376,837 was a later quick action patent, and is the one which was so broadly sustained by Judges Townsend and Shipman in the former suits.

We need not recite here the claims in suit as the decision will be found in full in another part of this issue. The broadest claims sustained are one and two of Patent No. 360,070, and one of Patent No. 376,837. The first claim is for the combination of the usual parts in which the emergency valve is actuated by the triple valve piston, and independently of the main valve, and admits air in the application of the brake directly from the train pipe to the brake cylinder. The second claim is the same combination, introducing, however, the element of the "further traverse" of the triple valve piston. The first claim of Patent No. 376,837 is for a valve controlling communication between the brake pipe and the brake cylinder, a piston independent of and unconnected with the triple valve piston, but actuated by pressure from the auxiliary reservoir in a direction to impart opening movement to the auxiliary valve.

The defendant's valve has the emergency valve; it is actuated by the piston of the triple valve, and the fact that this actuation is procured by multiplying parts does not evade claim 1. The Judge's words seem to us to say that Westinghouse controls the emergency valve actuated by the triple valve piston whatever train of mechanism or movements may be introduced between the two.

With regard to claim No. 2, of Patent No. 360,070, the judge is equally clear in saying that the operation of the emergency valve by the "further traverse" of the main piston is still infringed, notwithstanding the introduction of supplementary parts. It appears, therefore, that any known mode of operating an emergency valve through the movement of the main piston of the triple, whether there is direct mechanical connection or a sequence of movements of parts not actually connected by metal or other substance, infringes patent No. 360,070.

But still another important point is covered in this decision. The effort was to evade claim 1 of patent 376,837, by the use of a supplemental chamber, and calling it something else than *an* auxiliary reservoir, and limiting the Westinghouse patent to *the* auxiliary reservoir. This sophistical evasion Judge Lacombe disposes of by ruling that the supplemental chamber in the defendant's valve is, during part of its function, an auxiliary reservoir, and contains air under auxiliary reservoir pressure; the claim is therefore infringed. Thus the only remaining way of working an emergency valve, that has shown any promise of being of practical use, is also covered by the Westinghouse patents.

### Crossings of Electric Street Railroads.

At Plymouth, Pa., the Pennsylvania Railroad has been successful in preventing the construction of an electric street railroad across its tracks at grade. The County Court of Montgomery County has issued a decree requiring the street railroad company to build an overhead bridge suitable for its own use and for the other travel on the road in question. The company must give a bond that it will lay no tracks on the bridge until its share of the construction shall be paid. The press despatch from which we take these facts says that this decision will have the effect of preventing any further construction of electric tracks across steam railroads at grade in that county. It would be pleasing to think such a statement true, but probably there is no better basis for it, in such a sweeping form, than the reporter's enthusiasm.

At Braintree, Mass., a few days before Christmas, a street railroad company succeeded in laying its tracks across the Old Colony between 2 a. m. and 9 a. m., without interference by the railroad company, and according to the reports, the Superintendent or other manager of the electric company took this action without the knowledge of his company's counsel and contrary, in fact, to that official's advice. The New York, New Haven & Hartford (Old Colony), whose Division Superintendent, with three other officers, is now in jail for inciting to riot at Abington in a similar case, did nothing to prevent the laying of the Braintree crossing, but secured an injunction a few days later, ordering that the crossing be made by the use of frogs and that the rails first laid be taken up. The General Superintendent of the road, Mr. E. G. Allen, says that in view of the decision of the Supreme Court of the State, in the Abington case, the road has decided to take no action in cases of this kind, except so far as may be necessary to protect the safe and free passage of its trains.

We have not seen this decision, which so strongly sustains the town officers in exercising such complete authority over a railroad crossing; no doubt it is in strict acccordance with the will of the legislature as expressed in long standing laws, and is based on the fundamental principle, long cherished in Massachusetts, that municipalities shall manage their roads to suit themselves; but there can be little doubt that the conservative public sentiment of the State now demands a change of policy to meet the changed conditions. The statutes and court decisions which have been the basis of the law hitherto, were made on the assumption that street traffic was slow enough and manageable enough, and small enough in volume, to warrant some laxity or risk in the establishment or management of railroad crossings; and the reasonable limits of such laxity have probably been duly observed; certainly as well in Massachusetts as anywhere else.

But, as must be apparent to any one who stops to reflect a moment, the establishment of an electric line at once changes all these conditions. The cars are run faster than any street vehicles have before been run, and the rules about controlling speed and about the proper place to apply brakes on approaching a crossing, are peculiarly liable to be disregarded, on account of the inexperience of the average motorman. Unless a better grade of men are employed, this inexperience or its equivalent is likely to be a permanent factor in the case. And, as every one knows, a place where the track is rough, as on a crossing, is just where the electric power is mos likely to fail or make trouble. And finally, an electric line, suddenly increasing the speed and decreasing the cost of travel, often increases its volume very materially. These considerations make it highly necessary, not only in Massachusetts, but in every other state, that where the laws do not adequately provide for safety at such crossings they be at once changed so as to make the necessary provision.

Any action tending in the least to increase the danger at a grade crossing is contrary to the expressed policy of the State of Massachusetts. The special commission of engineers which investigated the subject in 1889, reported that of the 2,000 or more crossings in the state a large proportion ought to be at once abolished and that the changes necessary to abolish the whole would cost $40,000,000; and the State appropriated $500,000 a year for ten years to help carry out the more important of these changes. This would certainly seem to be a very definite expression of public opinion. So far as the letter of the law is concerned a crossing is simply a crossing, whether it is used by a hundred people a day or by 20,000 a day, and whether they travel at three miles an hour or at thirty; but that in point of fact different crossings require different regulations is too evident for argument. Hitherto the question of *what* difference—whether to employ a flagman or provide gates or change the grade—has been left largely to local regulation; but that method of treatment is clumsy enough at best, and the difference between a street traversed by electric cars and all other streets is so marked that there would seem to be good reason for considering the enactment by the State legislature of definite regulations for electric crossings. And if Massachusetts is to maintain her high position of leader for all the other States to follow she must not retreat from the advanced position she took in 1890.

We do not see much in the editorial columns of Massachusetts papers on this subject, and we are not sure but the Legislature is in advance of the press of the State concerning it; but there are two papers, the *Springfield Republican* and the Boston *Post* which have recently spoken strongly and plainly. The *Post* says:

> These grade crossings are a great mistake, and none should be permitted. If existing law is not sufficient to prevent them, there should be more law made to cover the case. The abolition of grade crossings of railroads has been made a part of the policy of the State of Massachusetts. The work of reform is going on steadily, and it will not be a great while before the State will be rid of these death traps. It is costing a good deal of money to do this; but no one complains, because it saves human life. In the face of all this, it is foolish, absurd and reckless to authorize grade crossings of electric and steam railroads, and if the courts can stop it the people will be thankful.

We do not wish to discourage the editor of the *Post*, but rather to spur him to more vigorous effort, when we remind him that only 2½ per cent. of the crossings in the State have been abolished in the four years since the law was passed. If he wants to say with truth that "it will not be a great while" before the reform is accomplished, he must arouse his neighbors to help on the movement. Only one or two railroads have taken hold of the problem with a vigorous hand.

### Filing Systems for Engineering Offices.

One of the topical questions that was discussed at the last meeting of the American Society of Mechanical Engineers is "What Form of Filing Cabinet Have You Found Most Convenient for Clippings, Etc.?"

"Clippings, etc.," include a good deal, if they cover all that is brought into an engineering office that is worth keeping. Clippings are the most important class of data which must be kept to make an engineering office what it should be. There are drawings, tracings, blue prints, specifications and small and large photographs and pamphlets, all of which must be filed so that they can be reached without delay. With a small amount of material the problem is easy, minute classification is possible and references are handy, but when an office has been established some years and a large amount of material has been flowing into it each year, which cannot be destroyed without running the risk of throwing away something that may be badly wanted, the problem is different and the volume of material becomes the controlling element. Take 2,000 drawings, blue prints and tracings of all sizes, 1,000 pamphlets and 6,000 or 7,000 clippings, notes and memorandums, photographs, specifications, etc., covering a wide variety of subects, and classification of the material itself into packages, which contain only that which relates to a given subject, is pretty nearly impossible and not so useful as a classification in an index which refers to a definite place where the drawings or information can be found.

For instance, if drawings be filed in drawers, each marked for a given subject, and they be numbered and about fifty put in each drawer the result, in a busy office, is bad. The number of drawers increases until all the convenient space is filled with cases and then rolls and packages are tied up with string and piled on shelves to

take the overflow. The drawings, being of all sizes, cannot be kept in sequence in the drawers and they get dirty and worn with handling. It is a nuisance to be continually lifting thirty drawings out, to put in or take out drawing No. 31. It is the same with pamphlets; if they are placed in cases under different headings, one has frequently to turn over thirty or forty in order to get the right one; with newspaper clippings, memorandum and sketches, if they are kept in packages, one has to search the whole lot to get the individual one that is wanted.

Almost every conceivable system has been tried and written about and they all work very well so long as the *volume* is small and the occupants of the office have patience and endurance, but when the amount of matter becomes so great that it is a problem to find a sufficient number of cubic feet into which to put the material itself, to say nothing of filing cases, drawers, etc., and when there is a rush of business, one becomes jealous of every cubic foot taken up by woodwork and of every minute spent in looking over material that is not wanted to find what is wanted. At such times it is worth a good deal to have a definite reference to a definite place, so that it is only a matter of a little muscular work to take down a volume and turn directly to the thing that is wanted. In the new office buildings, where the rent is about two dollars a square foot a year, and where the work is of a kind that demands immediate attention, everything must be subordinated, in the matter of filing, to time and space and it is then that beauty, symmetry and ornamentation in filing apparatus is less attractive and one finds his admiration centering upon the accuracy, certainty and definiteness of the plan.

There is another feature of filing that is most important, it is the accessibility of things. The temptation is very great not to look up a reference when it has to be hunted for with no certainty about how long it will take to make the search, and it is not every poor engineer who can have an intelligent office force to look up small matters.

It appears then that the most important and desirable qualities of a filing system in a busy office are: accessibility, to save time, definiteness, that is a specific place for each reference, to save wear and tear on one's mentality, and small total volume to save rent. This is practically what has been done in all of the large locomotive works, where a saving in time is a direct saving in money. That is, the drawings are actually bound in volumes and paged and indexed and it is no more trouble to look up one drawing than another and the time required to look up a reference is a definite and well understood quantity. This is not true of any plan of filing drawings and other material where it is bunched togther in drawers or packages.

An example of condensed files for engineering matter may be found in the office of Mr. D. L. Barnes, Chicago, in the Rookery Building. Papers, magazines and periodicals, about fifty in all, are bound in expanding binders as soon as they are received, and hung on the walls, thus occupying practically no floor space. Each volume as completed is bound at once and placed in the library. All trade pamphlets are bunched in a few subdivisions as they are frequently changed by manufacturers, and old ones need not be kept after the new ones arrive. Pamphlets, needed for reference, and miscellaneous engineering papers are bound together with two bolts and two strips of wood to make a volume about four inches thick. These are recorded in the card index and have the contents written on the back, which is made of a heavy piece of paper inserted under the wooden strips. The books (about 800) are indexed under the authors and subjects. All other matter, whether drawings, blue prints, tracings, photographs, newspaper clippings, etc., are folded so as to be put into a series of scrap books about 18 by 14 inches, and are attached to the leaves by gum so that they will not fall out, although they may be taken out if necessary. Each article when filed is marked with the number of the book and the page and is recorded in a card index at least twice, and frequently three times, under different heads. Locomotives and cars have a special index on printed cards, which gives a more minute classification, in addition to the general classification in the main index. Everything in the office that may be needed for reference, outside of trade catalogues and the correspondence files, is either in the form of a book in the library or is in the series of scrap books which are marked "Engineering Files." In this way new men in the office need little or no instruction in looking up data. Outside of standard reference books, which are catalogued, everything is in the card index and the cards give a definite reference to a book and page number and the time required to find the reference is limited to the search in the card index and the taking down of the book and turning to the given page. From time to time the scrap books are taken down and obsolete material is removed and the cards taken from the index, and in this way a limited number of files is sufficient for several years; the space made clear by taking out obsolete material is filled with new matter. The files are about five inches thick, covered with black canvas and are held together with a strap. They are of such a size that they will stand erect on a shelf without being supported.

The advantage of this system is that a vast amount of material can be filed and indexed in a small space and one piece of information is just about as accessible as any other and all can be reached definitely and quickly. The disadvantage is that the individual volumes are not devoted to single subjects and in making a general search with a large number of references for a given topic, several volumes have to be consulted, but such a search is not common, generally one knows what is wanted and it is perhaps best to know exactly where it is and how much time it will take to get it rather than to have all of the material relating to an indiviual subject collected together in one bunch at the expense of space and at an increased cost for filing. It is claimed that the system we have just described is one in which the largest amount of matter can be filed with the least expenditure of time and money, but there may be other systems that are more efficient and cost less that have not been described in technical journals so as to be generally known.

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Excitement among deadheads in New York State concerning the catastrophe which fell upon them on Jan. 1, continues high, up to the time we go to press. All State officers who would be interviewed have given their opinions at considerable length, and all who gave them to reporters who were solid with the city editor have had their views printed. There is not much variety of sentiment, however, and it will be necessary to wait until the unfortunates have actually paid for a few tickets before it will be possible to judge how serious the calamity will prove to be. Some city officers in New York and Brooklyn are trying hard to make the law and the facts fit in with a theory of theirs that policemen traveling on public business ought still to be carried free, provided the railroads are willing to carry them; and a prominent Tammany official has made bold to frankly avow this theory in public. General Passenger Agent E. C. Lapey, of the Buffalo, Rochester & Pittsburg, has resigned his position as School Commissioner in Rochester, on account of the change in the constitution. Other resignations are reported in other places, though we have not heard of anyone giving up an office which had a salary attached to it. The New York *Sun*, which is a standard authority in religion, politics, morals and poetry, prints an editorial on the pass question which we quote in full:

"All passes and privileges to editors, reporters, and to other newspaper people should be withdrawn by the railroad and telegraph companies. There is no reason why these people should get gratuities of any kind at the expense of others. Deadheading is a habit that ought not to be encouraged. Let every one pay his way, pay as he goes, pay for all services rendered, and pay for everything excepting those things which cannot be paid for."

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City Engineer Jackson, of Boston, has lately counted the people traveling on some of the streets in that city, his aim being to furnish information for the Rapid Transit Commission, which has in hand the problem of providing an underground or overhead railroad to relieve the congestion in the most crowded parts of the city. From several tables printed in the *Boston Herald* we take the following totals, showing the traffic on Tremont street between Winter and Bromfield streets (one short block) for 12 hours, 7 a. m. to 7 p. m., on Dec. 21, on which day the weather was clear and mild.

| | Northbound. | Southbound. | Total. |
|---|---|---|---|
| Carriages and wagons . . | 2,073 | 1,389 | 3,462 |
| Persons on same . . . . . | 2,755 | 2,001 | 4,756 |
| Pedestrians . . . . . | 53'198 | 56,300 | 109,498 |
| Street cars . . . . . | 1,806 | 1,625 | 3,431 |
| Passengers on same . . . . | 27,461 | 27,171 | 54,632 |
| Total persons . . . . . | 83,414 | 85,472 | 168,889 |

This portion of Tremont street is traversed by more street cars, we believe, than any other street in the city. The traffic seems to be more nearly evenly divided, as between north-bound and south-bound, than we should suppose to be the case. On the whole, the pedestrian and street car traffic is heavier northward in the morning and southward in the evening, though not so much heavier as it probably would be a little farther south.

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The newspapers have stated that the Baldwin Locomotive Works have been experimenting with an oil burning arrangement on a locomotive on the Baltimore & Ohio Railroad. It is true that experiments were made on a large engine, and this was done in order to test finally a device which has been applied by the Baldwin Works, to a locomotive for which oil fuel is specified. Of course we do not need to remind the readers of the *Railroad Gazette* of the fact that nobody expects to revolutionize engine fuel in the United States, or that any railroad man or locomotive builder has any notion of a general introduction of petroleum fuel in this country. The commercial reasons for not using it are overwhelming; the mechanical difficulties are very slight. Still there is a certain field for petroleum fuel even in the United States. A number of small eastern lines could use it without loss, and on the Pacific Coast it can often be used with profit; that is, oil at 2¼ cents a gallon is equivalent to a fair coal at $3 a ton. When we consider that the Pennsylvania Railroad alone would consume on its locomotives over one-third of the total production of petroleum in the United States it is at once evident that there is no possibility of its being adopted generally as a locomotive fuel in this country.

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"To accommodate persons who attend the oratorio, Dec. 22, the Newton train, advertised to leave Boston at 10.10 P. M., will not leave until 10.30 P. M., or 20 minutes after close of the concert." This notice was issued by the Boston & Albany last week. A superficial reading led to the impression that the train would be held until 10.30 in any event, when, in fact, a more careful study of what might be termed its hidden meaning, showed that if the entertainment closed at 10.05, the train would leave at 10.25, and this is exactly what did occur. Those who had not comprehended the full import of the notice took their time in going to the station, and when they arrived there, much to their discomfiture, found that the train had gone, which was the last one for the evening. They heaped anathemas upon the management of the road. . . .

The foregoing is from the *Boston Herald*. This is regarded as a good joke on the passenger department of the road, and it is held that in the literary center of the greatest country on the earth there is no excuse for such slovenly English. But it is only a joke, for the statement that the 10.10 was the last train that night is a fiction of the space writer, and we feel constrained to defend the road for doing as well as it did. The time table shows another train at 11.02, so that in taking the people home immediately after the close of the concert, the road was merely contributing its mite to help them avoid an unnecessary half hour in the Tremont street ice-cream "parlors."

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Progress toward reorganization of the Reading, on the Earle-Olcott committee plan has been arrested. Last Monday that committee announced that it had received more than a majority of the general mortgage bonds; but that a sufficient number of the holders of income bonds and stock had not assented. Therefore, the trustee of the general mortgage has been instructed to bring suit for foreclosure and to press it. Still, the committee will continue to receive deposits of general mortgage bonds until January 31; and before the foreclosure sale it will submit a plan of reorganization which will give stockholders and holders of junior securities another chance to avert the sale. From the meagre phrases of the announcement made by the counsel for the committee the junior security holders can draw little comfort. The promises made to them are vague and guarded with conditions.

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The "irony of fate," which the reporters love so well, has struck the New York and New Jersey Bridge. When that remarkably able board was appointed by President Cleveland, to pass on a "safe and practicable" structure we all thought that the result would be a cantilever bridge or nothing. But the report of the board killed the cantilever plan for the present, at least, until the suspension plan is killed by the "logic of events," to borrow again from the beautiful vocabulary of the space writer. The one member of the board who fought stoutly and to the end for the cantilever bridge was Theodore Cooper, and now, behold, he is asked by the company to prepare specifications for a suspension bridge, which it is announced the company stands ready to build if it does not cost more than $23,000,000 for the bridge proper. When the specifications are made, bids will be asked for—at least that is the latest statement from headquarters.

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The annual report of General Superintendent White of the United States railway mail service makes a strong plea for the widows and orphans of clerks killed while in the performance of duty, and relief for others totally disabled by accidents. As the law now stands a vacation of 30 days without loss of pay is granted to those who may recover sufficiently to attend to their duties, but Mr. White thinks that those who are permanently disabled should be provided for, and failing in this, at least $1,000 should be paid to the widows and orphans of those who are killed. Four clerks were killed in train accidents in the year ending June 30, 1894, and 48 injured.

## NEW PUBLICATIONS.

*Practice and Theory of the Injector.* By Strickland L. Kneass, C. E., M. Am. Soc. M. E., New York: John Wiley & Sons, 1894. Octavo, 132 pages, with numerous illustrations and alphabetical index. Price $1.50.

This is the sort of book that the engineer likes to see. It gives the history and the theory of, and the experience with, the mechanical device of which it treats. The language is simple and the mathematics are well explained and are not more complicated than is necessary to a fair understanding of the theory. There are a good index and some good cuts, but the press work and the paper do not do justice to the work of the author.

The early history in the first chapter is condensed so that it may be read quickly without weariness and the development of the principle in the second chapter is so clearly laid down that one can grasp the general features of various injectors with little study. The definition of terms in the third chapter should perhaps be read before taking up the second chapter, otherwise the technical school student, and those not particularly familiar with the subject may fail to understand quickly the meaning of what is said in the second chapter on the principle of the device.

At first sight the fourth chapter, on the delivery tube, appears somewhat complicated owing to the mathematics that are introduced as a further explanation, but it will be found that all that it is necessary to know for practical purposes is thoroughly explained in simple English in the same chapter. The fifth chapter, on the combining tube, and the sixth, on the steam nozzle, give information about jets of steam that is useful in studying other devices than injectors and particularly is the matter in that chapter applicable to steam turbines and calorimeters. The pictures of the shapes of steam jets from different orifices and the pressures and velocities at different parts of the orifices were given sometime ago by the author of this volume in the Transactions of the American Society of Mechanical Engineers and the Engineers' Club of Philadelphia, but in these publications they were not explained to the extent that they now are in this new work. Chapters seven and eight, on the action and application of the injector, give the efficiency under different conditions and describe numerous types in common use in this country and in Europe.

The last chapter has some interesting results from comparative tests of three patterns of No. 9 injectors of the lifting type, at various steam pressures, and shows the difference between the maximum and minimum capacities for pressures varying from 40 to 160 pounds per square inch. It is noticeable that there is a wide difference in the range

at the different pressures; for instance, while the range for three types is nearly the same at 100 pounds, they differ greatly at 40 and 160 pounds. It is seen that injector "A" has the smallest range at 40 and the greatest range at 160, while injectors "B" and "C" have a wide range at 40 and little range at 160 pounds. This may explain why it is nearly impossible to regulate some types of injectors closely enough to enable the engineer to "run by the injector" when the pressure is high. The expression "run by the injector," means, in locomotive parlance, to set it so that it will give the proper supply of water to the boiler during a run, without shutting it off and putting it on at intervals. This is an important point to study in selecting a proper type.

Another set of tests shows the range when the temperature of the feed water varies, and this is of importance when a heater is used in the winter time to prevent the water in the tank from freezing, as the water is then liable to get very hot. The tests show that injectors "A" and "B," for instance, more quickly lose in range of capacity as the temperature of the feed water increases, than does injector "C."

Taken altogether this book is the best that has been published on the subject.

*World's Water Commerce Congress.*—Among the numerous congresses held at the Chicago World's Fair, one of the three or four which to us seem to have been of the most interest, was the Water Commerce Congress. The papers read at this Congress have now been collected in convenient form by the Secretary of the Congress, Prof. William Watson, Mem. Am. Soc. C. E., Secretary American Academy of Arts and Sciences, 107 Marlborough street, Boston. We are not informed as to what arrangements have been made for the circulation of these papers, but doubtless information can be had of the Secretary. The papers are printed separately and not bound, but collected in a convenient cover. They are handsomely printed and are in good condition for binding in case one chooses to assemble them in a permanent volume.

We cannot do more here than to indicate the range of these papers. Besides the report of the Secretary, which contains condensed minutes of the meetings and a list of members, there are some twenty separate papers which range pretty well over the civilized world. One of them, for instance, is on the "Port of Havre," by the Baron Quinette de Rochemont. Another is the "Chignecto Ship Railway," by Mr. Ketchum, the Chief Engineer, and another one is on "The Work of the First Ship Railway," by Mr. William Smith, which is a description of an installation at the Edinburgh Exhibition in 1890. Mr. Thomas Keefer writes on the "Canadian Water Ways from the Great Lakes to the Atlantic." Mr. Molinos, President of the lower Seine and Oise Towage Co., writes on "Chain Towage with Magnetic Adhesion"; and there is a paper from Prussia on "Electric Propulsion on Canals." General Comstock, United States Engineers, contributes a short paper on the "Improvement of the Mississippi below Cairo." Of course, the water ways from Lake Michigan to the Mississippi come in for liberal treatment. There is a paper on "New Water Ways Required to Meet the Demands of Commerce in Russia"; another on "Water and Rail Rates in Hungary," and one on "Ship Canals," by Mr. Vernon-Harcourt. These are titles taken at random from, as we have said, about 20 papers. The whole collection is a singularly interesting and valuable set of monographs.

*The Magazine of Travel:* E. H. Talbott, President and Manager, 10 Astor place, New York: $3 a year.

This is a new monthly magazine, and its object is pretty well indicated by its title. The proprietor was long the editor of the *Railway Age*, and his name will therefore be familiar to many railroad men. Of the eight principal articles named in the list of contents of the first number (January) the first is by Chauncey M. Depew, on "American and Foreign Travel Compared." He writes for an "American" audience, not to say prejudiced Americans. The other articles are stories and descriptions of life and scenery in various parts of the world, including impressions of Mexico, by the editor. There is a list of about 100 books of travel, many of them well-known, which the publishers offer for sale. The magazine is printed on fine paper and presents a good appearance. Like all magazines nowadays, it is well supplied with handsome direct process cuts.

*International Electrical Congress, 1893.*—The proceedings of this congress, held at Chicago Aug. 21-25, have been issued by the American Institute of Electrical Engineers, and copies may be had of Ralph W. Pope, Secretary, 126 Cortlandt street, New York City, at $3 each. The matter fills a thick volume, 6 in. x 9 in., containing all the papers in full. There are a history of the congress by Mr. T. C. Martin and two good indexes, one of titles of papers and one of authors and participants in discussions. The frontispiece is an engraving from a photograph, of the official delegates in a group.

## TRADE CATALOGUES.

*Calendars*, both handsome and useful, have been issued for 1895 by the Boston & Maine, the Chicago & Northwestern and the Lehigh Valley. The engravings which form the titles to these calendars serve to remind one that the direct process cut, made from a photograph, has not yet quite driven hand engraving out of the field. The Boston & Maine picture is a bird's eye view of the new Union passenger station at Boston, made by John A. Lowell & Co., in their well-known elegant style. The scene is very much idealized, of course, but then a real photograph would fail of its object. The Chicago & Northwestern's artist shows in a very effective manner that San Francisco is really a summer resort as compared with Chicago. The Lehigh Valley also finds itself compelled to idealize in order to show the varied scenery of its extensive line; but then that familiar Mauch Chunk mountain would not half accomplish its mission as an advertisement if the artist were not allowed some license. The Link-Belt Machinery Co., of Chicago, issues a pleasant pictorial reminder of the well-known fact that its mechanical devices are an important factor in turning the world around, and its calendar has only one week (instead of a month) on a page. The back of the card has the best condensation of the United States postal rates that we ever saw; but it only serves to make one want a second copy, for who ever thinks of turning to the back side of a calendar?

*The Westinghouse Electric & Manufacturing Co.* issues a souvenir annuoncing the completion of the principal buildings at its new works, at Brinton, Pa., twelve miles east of Pittsburg. These buildings, before being fitted with machinery, were used for the reception given by the citizens of Pittsburg to the Grand Army of the Republic last September and the pamphlet now issued gives fine interior views, showing the appearance of the large shops (empty) at that time. The largest building is 231 feet by 754 feet and the five principal shops cover nearly eleven acres. The souvenir is accompanied by a colored print showing a bird's eye view of the works. It bears the name of Thomas Rodd as architect.

## Substructures.

(*Concluded from Page 7.*)

increased strength but decreased compressibility and the further advantage of an additional weight which is sometimes a great assistance in moderate sized piers where the depth is great. . . .

The duty of the foundation is simply to carry the pier. The European practice is to build comparatively heavy piers, and sometimes to use much ornamental work. There is nothing in which we are at a greater disadvantage, compared with Europe, than in masonry. The wages paid to ordinary laborers here are higher than those of Europe, but the wages paid to all classes of masons are not only higher than in Europe but utterly out of proportion to the difference between laborers' wages. There is no part of the world where masonry is relatively as expensive as it is here. Hence the necessity of cutting down the size of piers. Perhaps it is well that we cannot afford to ornament. The ornamentation of the architect of the present day is little better than millinery; and while engineers could probably be trusted better than architects to make ornaments appropriate to the object ornamented, I do not feel sure that they would succeed.

Fourteen years ago I had occasion to design a bridge pier for a bridge across one of our western rivers, and I tried to make an ornamental pier. When the plans were completed I didn't like them. One change after another was made, all tending to simplicity. Finally the plans were done. From high water down the pier was adapted to pass the water with the least disturbance; it had parallel sides and the ends were formed of two circular arcs meeting. Above high water the ends were made semicircular instead of being pointed. The pier was built throughout with a batter of one in twenty-four. A coping two feet wider than the body of the pier projected far enough to shed water, and the projection was divided between the coping and the course below. Another coping with less projection surmounted the pointed ends where the shape was changed. It was as simple a pier as could be built, and in every way it was fitted to do its duty. I had started to make a handsome pier. The pier that was exactly what was wanted, for the work was the only one that satisfied the demands of beauty. Forty-three piers of precisely this design (no change having been made except in the varying dimensions required for different structures), besides eight others in which only the lower parts are modified, are now standing in eleven different bridges across three great western rivers.

In designing a pier it must be remembered that the portion of the pier below the water has more to do with the free passage of the water than that above water. In a deep river the model form of the pier should begin near the bottom of the river and not at low water. Many rivers in flood time carry a great amount of drift. A pier like that which I have described catches but little of this drift. If, however, a rectangular foundation terminates but little below water that foundation may both disturb the current and catch the drift. . . .

The impression went abroad many years ago that the pneumatic process was a very expensive one; while pneumatic foundations are usually expensve, it is not the process which makes them so. In sand or soft material ten cents per cubic foot will usually cover the whole cost of excavation. It is not the pneumatic process that makes the foundations expensive, but the material of which those foundations are made. In a pile foundation the full sized pier begins at the top of the piles, it begins where the foundation leaves off. In pneumatic foundations the full sized piers begin at the very bottom, and it is this material, between the bottom and the top of the foundation, which makes the pneumatic foundation expensive. Any other form of construction which carries the full sized pier to the same depth would be equally costly.

There is, however, opportunity for great improvement in the matter of masonry construction. . . . There is room for improvement in the selection of stone, in quarrying and in stone cutting here; but the development in this direction which you are likely to see will probably be more in machinery for quarrying, cutting and handling than in anything else. Cheap transportation makes the best quarries accessible to all. There are, however, three specialties in which you will have full opportunity to better our existing tools. The first of these is brick; the second mortar; and the third concrete.

There was a common feeling among engineers twenty-five years ago that brick was not a durable material for permanent work. If anyone dared to say that Rome today receives its water on the same brick aqueduct that supplied a portion of the city in the days of the Cæsars, the prompt answer came that the climate was different. Climate is something, but the character of the brick and the character of the mortar is a great deal more; with as good brick and as good mortar as the Romans used the same work would stand almost as well in the most trying North American climate.

Very hard bricks are used in England for almost all kinds of railroad masonry. The piers of the Dufferin Bridge at Benares are built of hard red brick, all of which were carried to the piers on the heads of the natives, who were satisfied if they could earn four cents a day.

As to mortar, the general practice of making mortar in America is of the crudest kind. Sand, cement and water are dumped into a box together, mixed up with shovels and hoes, and then used in the walls. It is a crude, loose process, and whatever good results there are are due to the excellence and abundance of the cement and not to the skill of manipulation.

The piers of the Benares Bridge are laid up with a mortar composed of lime and brick dust, which has set as hard as Portland cement; the secret of this work. The Hindus will plaster a wall with lime mortar and finish it with as high a polish as glazed porcelain. First they take the lime and grind it; then they take the sand and grind it; then they grind the lime and the sand together, all of which is generally done by women with hand mills; then the mortar is wet and ground in a mortar mill by bullocks, and then it is ready for use. If it is used to plaster a wall a man will spend a whole day pounding a single square yard, and a few more days in rubbing it down until the polish is done. We cannot afford this amount of manual work, but it tells the secret of good mortar. What is needed is work. Mortar everywhere ought to be mixed by machinerry and by a machine which will work it very hard. There is abundant room in this field for you to do much better work than any of us have. . . .

## A Traffic Indicator on the Alley Elevated.

There is an automatic, double acting, self-adjusting, and self-imposed traffic indicator in daily operation on the Alley Elevated of Chicago, which the officers of the road have reasons to believe is infallible and everlasting. It is not patented, and it is doubtful if it could be patented, not only because of the length of time it has been in public use but also because there is no one who could, rightfully make a claim for a patent. It was not designed, it just grew, and no one knew anything of it until it had become a fully developed indicator. It owes its origin and existence to a combination of circumstances; first to the design and arrangement of the stations and platforms of the road severally and a similarity of arrangement of a large number of them; second to the hustle, the desire to save every minute, of the patrons of the road, partly also to their laziness.

To properly understand the value of a traffic indicator on this road, it is necessary to know that, for its paying traffic, this road is largely dependent upon the caprices of the weather. In either extremes of temperature out of doors, or during storms, the south side people patronize the street cars, which are nearer at hand, rather than walk a few blocks to the elevated road. The officers of the elevated are always anxious to know what proportion of the travel they are getting each day and a ready indicator is appreciated by them.

The indicator is the south car, excepting the smoking car of each train and the estimates of the traffic are obtained from the proportion of occupied to unoccupied seats in this car. The exit and entrance to the platform at every station are at the extreme end of the platform and at a large majority of the stations, including the down town terminus, these are at the north end of the platform. It is therefore more convenient to board and to leave the trains at the north cars. The patrons of the road have long since calculated the saving in time and energy due to riding in the north cars of the trains and always make an effort to find seats there before going to the south cars; the officers of the road have made estimates of the number of passengers carried from the number riding in the south cars and now they need only to look in this car to know about what proportion of the daily travel the road is getting.

## A Tile Roof for an Electric Lighting Plant.

The accompanying engraving shows the roof construction recently adopted by the City of Chicago for a municipal electric lighting station now under construction on Halsted street, near Blue Island avenue. The building occupies a space of 50 ft. by 185 ft. 6 in., and has a height of 25 ft. 9 in. from the floor to the bottom member of the roof trusses. The walls are of brick, laid on concrete and masonry foundations. The floor consists of a layer of concrete 6 in. thick, laid on a 11 in. bed of cinders. A brick partition separates the space to be occupied by the boilers from that in which the engines and dynamos are to be placed.

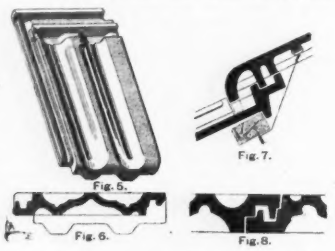
It was at first proposed to use a roof of the type previously used by the city on some of its pumping stations and electric light plants. This consists of a covering of corrugated iron resting directly on the purlins, covered with a layer of concrete in which are embedded nailing strips for the slates. This was abandoned on account of the corrosion of the corrugated iron when exposed to gases, and because of the cost. A tile roof was selected as being the lightest and most durable for the place, and the roof designed to conform to the requirements of a grooved tile made by the Ludowici Roofing Tile Company.

The roof trusses are light angle iron, Fink type, spaced 12 ft. apart, with a raised ventilator along the ridge of the roof, as shown in figs. 1, 2 and 3. Fig. 4 shows the details of the truss, which is a common construction with angle iron members and plate connections, except that the upper member is reinforced by a 9″ by 5-16″ plate between the angle irons for its entire length. This was necessitated by the method of carrying the roof. Instead of the truss being loaded at the panel points only, it carries what is practically a uniformly distributed load, and the top member consequently requires stiffen-

## Tile Roof for Electric Light Station.

ing. In place of the heavy longitudinal purlins usually carried by a truss of this type, light 4 in. channel irons are spaced at intervals of 13½", and the tile laid directly upon them.

Figs. 5, 6, 7 and 8, show the general appearance and




*Grooved tile.* *Head lock and wiring.*

construction of this tile and the manner of laying it. In this case, however, it is supported by the channel above mentioned instead of the timber shown in fig. 7. The method of tying down the tile as shown in fig. 7 is considered necessary only on very steep roofs, the weight of the tile and the interlocking of the adjoining edges usually being sufficient to keep them in place.

The tile is made in various sizes and in different shades of red. Glass tile is also made of the regular patterns and can be used by itself or in connection with the ordinary article in case a limited amount of light is needed. It is claimed that roofs of this type properly constructed are light, durable, and inexpensive. The roof which we show cost less than the roof first proposed on account of the lighter construction of the trusses which its use made possible.

Figs. 2 and 3 show in place and elevation the spacing of the trusses and the channels on which the tile is laid. It will be observed that the trusses are connected in pairs by horizontal bracing arranged as shown in fig. 3; a latticed strut at the ridge acting with the diagonal tie rods. The ventilator has no transverse bracing, but depends upon the strength of the connections, which are made heavier than would otherwise be desirable. The ventilator is braced longitudinally only in the two end panels. The bracing consists of two diagonal tie rods and a latticed strut in the ridge of the ventilator acting in conjunction with the strut in the ridge of the roof trusses to which reference has already been made. Fig. 9 is a section through the end panel of the ventilator, showing the details of the bracing. Fig. 10 shows the end framing of the ventilator, which is covered with tile, supported upon the light angles provided. Other details of the construction of the ventilator are shown in figs. 4, 10 and 12.

The inside of the walls of the building is faced with red pressed brick in order to secure the proper effect in connection with the red tile roofing exposed by the open iron work. To further carry out this effect the iron will be painted black.

The building was designed by the City Architect, Mr. Adolph Finkler, and the roof construction by Mr. Warren R. Roberts, City Bridge Engineer to whom we are indebted for drawings and information.

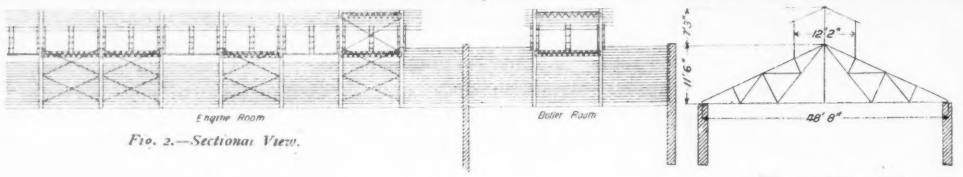



*Fig. 2.—Sectional View.* *Fig. 1.—Cross Section.*

*Half plan of trusses with ventilator above.*

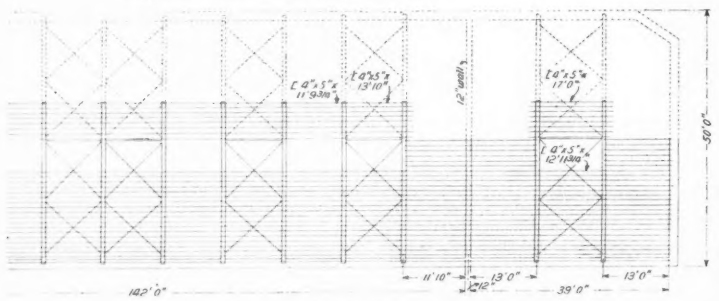



*Fig. 3.—Half plan of roof with ventilator removed.*

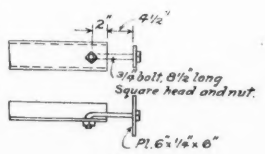



*Fig. 11.*

## Ventilator.

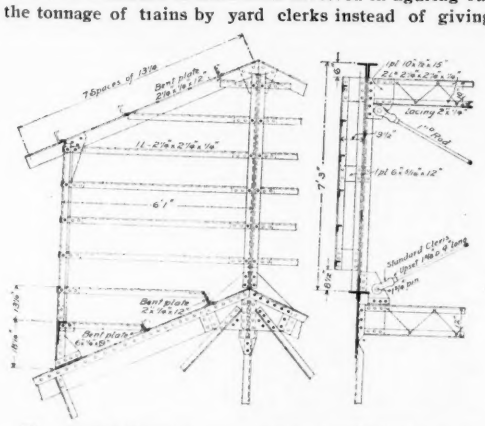



*Fig. 10.—End Elevation.* *Fig. 9.—Longitudinal Section through end panels.*

## Rating Train Loads by Weight.

THE COLUMBUS, HOCKING VALLEY & TOLEDO RAILWAY COMPANY.
COLUMBUS, Ohio, Dec. 28, 1894.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In reply to your inquiry about rating freight engines by tonnage, I will first give a brief history of the conditions on this road.

In March, 1892, the first test of this system of rating engines was made on the "Hocking Division" of the Columbus, Hocking Valley & Toledo Railway, between Nelsonville and Columbus. About 90 per cent. of the business northbound on that division is bituminous coal mined in and adjacent to Nelsonville. It is made up in trains at that point for Columbus, Toledo and other northern districts. All this class of freight is weighed before trains are made up and the billing is all done at the same station where cars are weighed and trains made up; hence the matter of arranging details was very simple.

In March, 1892, after giving the matter of loading engines considerable study, a record was taken of the tonnage of sixty-eight through freight trains between Nelsonville and Columbus, as shown by the billing. In addition to this, a record was taken of the time consumed in making the trip, including delays, state of weather, etc., that a fair comparison might be made later with the proposed system then in mind.

The standard train under the old practice of rating engines was for a 16 by 22-inch cylinder engine, twenty-five loaded cars, and for a 17 x 24 inch cylinder, 30 loaded cars. On this basis the sixty-eight freight trains were rated. This test was begun on March 7, and concluded on March 13, with the result shown below. It should be understood that the tonnage as billed, indicates the lading only—not the dead weight of the car. At the time I saw no reason to go so far as to include the dead weight. I took it for granted that the dead weight under the second test would about equal that of the first, hence made no note of it. Having concluded the first test and in looking over the figures showing the billed tonnage of the train, I was greatly surprised at the wide differences shown in weight of trains containing the same number of cars (25) and hauled by the same class of engines (16 x 22) the minimum being 381 tons and the maximum 600. For the larger class engines (17 x 24), thirty cars, the minimum was 510 and the maximum, 700 tons. In other words, the larger class engines, with an increased rating of five loaded cars per train, frequently had as little tonnage as the maximum load hauled by an engine with much less cylinder and rated five cars less.

| | Trains. | Loads. | Tons of lading. | Avg. loads per train. | Avg. tons per train. |
|---|---|---|---|---|---|
| Old plan..... | 68 | 1,841 | 34,425 | 27 | 506 |
| New plan..... | 68 | 2,072 | 40,291 | 30½ | 593 |
| Gain in new over old plan. | | 232 | 5,766 | 3½ | 87 |

The above illustrates the net gain for one week, at a time when the business of the road was at a low ebb. Had the business been normal, the gain would show relatively a more handsome result, but even on the above basis it may be readily calculated what the saving would be in fifty-two weeks. In fixing the minimum tonnage load per engine a minimum number of cars was also fixed, it being shown that 16 x 22 engines were making their schedule time with twenty-five loaded cars and 600 tons and 17 x 24 engines, with thirty cars and 700 tons, which was fixed as a basis below which the rating should not go. The result of the test gave as much satisfaction to the train and enginemen as it did to the management, as thereafter they each felt that like conditions existed, and the complaint of "dragging" behind some overloaded engine by a more fortunate engine with less tonnage was quickly done away with. If any "dragging" was done they were all "in it," so there was no room for a "kick." I have seen no cause to change from the new plan back to the old, and you will, therefore, understand that the new plan is still in use and still highly satisfactory to the management of the road.

As to the amount of extra work involved in figuring out the tonnage of trains by yard clerks instead of giving them arbitrarily a certain number of cars, I can say that since the clerks have become accustomed to the plan it entails no extra work whatever, and they are as accurate on a tonnage basis as they were on a car basis.

The result of the week's test made on this road made a saving of nine trains, or 1,116 train miles, with an increase of eighty-seven tons freight hauled per train run. This saving on a "dead freight" line would be more than doubled on merchandise lines, where a few tons of merchandise are thrown into a car and called a load.

To sum up, the saving from this source affects the train service, where reductions are made; the yard service, where proportionate reductions (as affected by reductions in train service) are made, the shops and the round house; and the change reduces the liability to accident by reducing the number of trains run.

Since December, 1893, the smaller engines referred to have been taken out of through freight service and we have substituted in their place engines with 19 x 24-inch cylinders, whose rating, under normal conditions of weather is 1,150 tons of freight with a minimum of forty-five loaded cars. The maximum number of cars for these engines frequently reaches fifty-five over governing grades.

M. S. CONNORS.

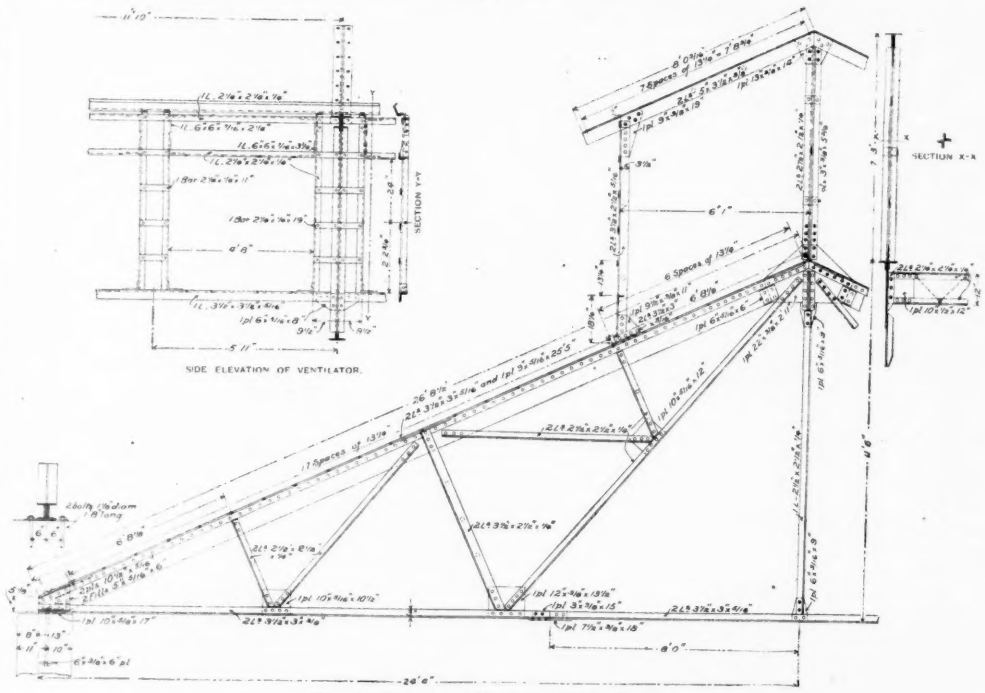



*Fig. 4.—Details of Truss for Tile Roof.*

The test of the tonnage system of loading engines was begun on March 26 and concluded on April 1, 1892, with the result shown in the second line of the table below. I should have stated that in arriving at a basis on which to fix the new rule of rating on tonnage basis, that the highest tonnage handled by each class of engines on the first test was fixed as the minimum load for that class engine under the tonnage rule—for example: Engines 16 × 22 were given 600 tons freight (not including dead weight of car) and engines 17 x 2, 700 tons. The comparative test of the old and new plan is shown in the table.

## TECHNICAL.

### Manufacturing and Business.

Mr. William J. Haskins, M. Am. Soc. C. E., has opened an office at 18 Broadway, New York, and will engage in general engineering work on his own account, having resigned his connection with the C. W. Hunt Company. Mr. Haskins will give special attention to designing and contracting for the erection of coal and ore handling machinery and light railroad supplies. He has had a valuable experience in that particular work. He has secured facilities to undertake contract work in this line or is prepared to design plants as an engineer.

At a meeting of the stockholders of the American Compressed Air Motor Co., held at Pompton, N.J., last week, the following board of directors was elected: John Fritz, C. A. Laurenson, John B. McDonald, Thos. R. Gue, Frank H. Clement, Jas. F. Lewis, W. B. Doud, Chas. W. Skiffe, Edwin F. Abell, Walter Dulany, H. Julius Smith, C. G. Johnson, Addison C. Rand, F. A. Brainerd, George E. Whipple, E. W. Dickerman, and R. D. Gillett. The following were elected as officers of the company: John Fritz, President; J. F. Lewis, Vice-President and General Manager; F. A. Brainerd, Treasurer; and W. B. Dowd, Secretary.

### Iron and Steel.

The Shoenberger Steel Company, of Pittsburg, has been incorporated with capital of $1,800,000. The directors are Charles L. Fitzhugh, Gottlieb A. Steiner and Henry Fitzhugh, Allegheny; John Z. Speer and J. Ramsey Speer, Pittsburg. Under the reorganization of the company, L. Fitzhugh, executor and trustee under Mr. G. K. Shoenberger's will, has a majority of the stock.

The Lookout rolling mill, at Harriman, Tenn., was last week sold to a syndicate composed of H. S. Chamberlain, J. D. Roberts, George B. Burrell, Boyd Ewing and Aaran Simpson. The sale was made under a decree of the Chancery Court, in the case of the East Tennessee Land Co. *vs.* the Lookout Iron Co. The plant will at once be put in operation.

## THE SCRAP HEAP.

### Notes.

The Brooklyn Elevated Railroad, like the Wagner Palace Car Co., has made its passes for 1895 in the shape of coupon books.

Messengers carrying special delivery letters from the post-office in Pittsburg, Pa., are allowed by the street railroad companies to ride free.

George Roberts, charged with wrecking a passenger train at Fontanet, Ind., July 12, pleaded guilty on trial and the court instructed the jury to bring in a verdict for a life sentence.

The Attorney General of New York has decided that members of the fire departments of cities are not public officers and therefore are not prohibited from riding free on railroads.

An order has been issued on the Baltimore & Ohio, requiring conductors and engineers to inform their crews of the contents of train orders, and to make sure that members of the crew fully understand them.

Elevator B of the Cincinnati, Hamilton & Dayton at Toledo was burned December 29; loss $525,000. One employee was killed by the fall of the roof. The Central Vermont Railroad lost 25 loaded cars in a fire at Burlington, Vt., December 24.

The Union Pacific has abandoned its dining-cars on all trains running between Omaha and Cheyenne and Evanston. Five cars will be laid up. The company has been engaged for some time in fitting up restaurants at various points between Omaha and Evanston.

The two sentences of Debs and the other strikers of six months each have been made cumulative at the request of the defendants' counsel, so as to facilitate an appeal in one of the cases. If, therefore, the appeal should fail the total term of imprisonment would be 12 months.

Train No. 104, the Erie accommodation on the Lake Shore & Michigan Southern, due in Buffalo at 11:45 a. m., in the past year has missed reaching there on time but once, and that was because of the pulling out of a draw-bar on a freight train at Buffalo Creek Junction.

The annual passes of the Pennsylvania for 1895 are made on safety paper, such as is used for bank checks. In the lower left-hand corner the number of the pass is perforated with small holes, and in the upper right-hand corner is a counter number, printed with a numbering machine.

Judge Speer, of the United States Circuit Court, has rendered a decision sustaining the constitutionality of the Glenn tax law in Georgia. This law authorizes the collection of taxes by counties and towns upon railroad property, and will affect chiefly the Central Railroad of Georgia. Ten counties united in the suit before the court.

The Sunset Limited express train of the Southern Pacific caught fire from a burning bridge near Benson, Ariz., on December 29, and two sleeping cars were burned up. The rest of the train was also damaged, but no serious injuries to persons were reported. The new passenger station of the Cleveland, Cincinnati, Chicago & St. Louis at Anderson, Ind., was burned on December 27.

A large number of persons in Pittsburg received packages by express about Christmas time, from a supposed diamond merchant in Chicago, with C. O. D. charges of $2.35. It is stated that many of the persons addressed paid the charges, carelessly thinking that the package probably contained a present; but in fact every package contained glass jewelry worth about ten cents.

The shops of the Union Pacific at Cheyenne were practically closed on Dec. 31, though 80 men are retained to do necesary local repair work. The management has decided that most of the work heretofore done at these shops can be done at Denver or Omaha. It appears that a principal reason for the closing of the shops was the demand of the men for higher pay than that paid to the shopmen at Denver. About 130 men will be discharged at Cheyenne.

The Chicago *Herald* issued a special edition for the Atlanta Exposition and engaged a special trains to carry the papers from Chicago to Atlanta on December 29, taking along about 40 Chicago newsboys. The train left Chicago at 2 A.M. and ran through in 17 hours via Evansville, Nashville & Chattanooga over the Chicago & Eastern Illinois, the Evansville & Terre Haute, the Louisville & Nashville, the Nashville, Chattanooga & St. Louis and the Western & Atlantic. The distance is 733 miles.

The Boston Rapid Transit Commissioners have decided to use the Haymarket Square passenger station of the Boston & Maine for the northern terminus of the proposed underground railroad through the city, and have agreed to pay the Boston & Maine $75,000 for it. This property, formerly the terminus of the Boston & Maine proper, and abandoned when the present new station was built, has an area of about 124,000 square feet, of which the Boston & Maine owns in fee 76,274 feet. The rest was formerly the "canal strip" and has been occupied under a perpetual easement.

At San Francisco two clerks of the auditor's office of the Southern Pacific and two ticket brokers have been arrested for stealing tickets from the company; and one of the clerks is on trial. The tickets manipulated were from Ogden to Los Angeles, with a stop over at San Francisco, the custom of the road evidently being to take up such tickets before the passenger reached San Francisco. When they were turned into the general office they were taken out, doctored and resold. It is claimed that 265 tickets were thus used in six weeks and that the thieves disposed of each ticket for about $10, the regular fare from San Francisco to Los Angeles being $15.

### Revision Work on the Pennsylvania.

Some of the newspapers have stated that the Pennsylvania Railroad has resumed the work of revising line and grade on the main line between New York and Pittsburgh. It is true that something is doing in this way, but it consists practically in finishing up pieces that were started two years ago or so. No general resumption of this sort of work has been made.

### Reading's New Storage Plant.

The Dodge Coal Storage Co., of Philadelphia, which has the contract for the erection of a coal storage plant for the Philadelphia & Reading Railroad, at Port Richmond, has the work well under way, and expects to have it fully completed by spring. The masonry for the foundations for the coal storage plant has been started, and the work is being pushed forward rapidly. This plant, which is to cost $160,000, will be erected on the property of the railroad company, north of the coal docks and extend north 1,800 ft. The plant will be of the most improved kind erected by the company, and will be constructed to operate six coal piles, two of 20,000 tons each, two of 30,000 tons each and two of 40,000 tons each, making a total of 180,000 tons. The cost of handling coal by this system is, under the contract, not to exceed four cents a ton, and is expected to effect a saving of $40,000 annually to the company.

### A Good Lubricating Compound.

Economy on a large railroad has been the theme of articles in these columns lately; but small roads are not shut out, and we print below a brief lecture on the subject, issued by the manager of a small road. Mr. W. A. Stowell, of the Montpelier & Wells River. He says:

MONTPELIER, Vt., Dec. 3, 1894.

*Circular Letter to Enginemen:*

Canadian Pacific enginemen are using the same kinds and same grades of oils that the Montpelier & Wells River is using at the present time. On their passenger trains they are making from 57 to 75 miles' run with one pint of valve oil, and from 20 to 28 miles with one pint of engine oil. On their freight trains they are making from 64 to 82 miles with one pint of valve, and from 21 to 29 miles with one pint of engine oil. I wish to have enginemen on the Montpelier & Wells River carefully consider the above, and try and beat the record if possible.

I do not wish you to understand by this that you are not to use *all the oil that is necessary*, but I do wish to have you use less oil and more care. After experimenting a little you will find that these two ingredients (oil and care), *well mixed together*, make an excellent lubricating compound, and one that will go much farther than oil alone, the way you are now using it.

If your eyesight is good and your judgment is what it should be, you will find that an occasional glance at the sight-feed will help you to make more miles to a pint of valve oil.

Be particular to shut off the oil supply to the sight-feed lubricator when standing at stations, or upon side tracks, for any length of time, and you will find it will increase your valve oil mileage quite a little. A little careful practice with the squirt can will enable you to increase your engine oil mileage very much. Always close your guide cups when your engine is to remain standing for any length of time. Bear in mind that every drop of oil that you waste, or do not use properly, makes its record against you on the wrong side of the book.

Commencing to-day, a careful record will be kept of the amount of oil (also fuel) used by each engineer. The one making the best six months' oil and fuel mileage record (engines and trains considered, of course) will have the preference of engines and runs during the summer of 1895.

On Monday, Dec. 10, each engineer will give me a written report of the actual number of passenger, mixed, and freight miles they make the first trial week; also the actual number of pints of valve and engine oil used, and the amount of coal consumed. Also give the number of drops per minute the oil is allowed to pass through the sight-feed when engine is working.

### Let's Try this on Liver-Cure Advertisements.

The Wenatchee Indians of Washington are protesting against what they regard as an act of vandalism and sacrilege committed by the Great Northern Railroad Company. The workmen of the company lately blasted out some big rocks near the Indian settlements, which were covered with hieroglyphics. The rocks were the sacred record of the Wenatchee tribe, and the inscriptions told of their chiefs and battles, and the whole history of the people. The Indians are naturally intensely indignant.

### The Largest Gas Engine in the World.

The largest gas engine in the world, according to the *Revue Technique*, is the 320 indicated horse-power, simplex engine, driving flour mills at Pantin, France, and taking its fuel supply from a special producer gas plant forming part of the mill equipment. With regular city illuminating gas the engine would be capable of indicating about 450 horse-power, but even as it is the load upon the engine is now not more than 280 indicated horse-power, representing, actually, 220 horse-power delivered. The engine has only a single cylinder, 870 mm (about 35 in.) in diameter, with a stroke of one meter (39.371 in.), and runs at a speed of 100 revolutions a minute. The coal used in the gas producer is of a poor quality, coming from the mines of Anzin, notwithstanding which the consumption per indicated horse-power per hour has been found, in regular running, to amount to not more than about 0.8 lb., corresponding to a very small fraction over 1 lb. per brake horse-power per hour.

### Cheap Street Car Fares in Philadelphia.

The reduction of fare by the trolley cars to Germantown to 5 cents and to Wissahickon and Manayunk to 8 cents furnish two very practical illustrations of the benefit to the public of the introduction of the new street car motor. One reduction was inspired by competition and the other appears to have been a concession to a popular demand possibly expedited by a desire to anticipate steam railroad competition. Under the reported traffic agreement between two lines occupying the chief streets lying immediately west of the Delaware, it is probable that with the opening spring passengers will be carried from any part of the city to any of the principal entrances of the East and West Park for a single fare. It is equally probable that the competition of rival lines will result in single fare transportation to Frankford in the northeast and Darby in the southwest. That many people now residing south of Lehigh avenue will seek homes farther from the heart of the city, may be surely counted on, but the sections abandoned for residence purposes will probably be occupied for business purposes. This was the effect of the introduction of the old street cars. The introduction of the trolley has more than doubled the possible residence area of the city.—*Philadelphia Times.*

### The Railroad Councils of Prussia.

The Prussian railway boards, or councils, first came into existence on January 1, 1883, and have been incorporated by law. They are (1) a General Railway Council (Landeisenbahurath) for the whole of Prussia, and (2) nine district councils (Bezirkseisenbahnräthe), one for the two departments or "directions" of Cologne and Elberfeld, and one each for the other eight directions into which the Prussian State railway system is divided. The number of members in the district councils varies from 20 to 54, and for each member a deputy or "understudy" is provided. The choice is made from the principal inhabitants of the district, merchants, manufacturers, and landed interest being all represented. The choice is for life. An executive committee is appointed to carry on the routine business of each council, but the whole council has a voice in everything relating to the traffic of the districts, especially as regards time-tables and tariffs. Some matters the district councils can decide on their authority, but as to others they can only petition the directional administration of the Minister of Railways. All matters of first importance, however are reserved for the consideration of the General Railway Council, which consists of a president and his deputy, who are chosen by the Emperor for three years, three confidential officials of the Ministry of Trade and Agriculture, two confidential officials of the Railway Administration, and 31 members chosen by the district railway councils, for each of which, as before, a deputy or "understudy" is provided. The General Railway Council must be consulted on the following subjects; (1) Normal tariffs for passengers and goods; (2) the fixing of general rates and classification of goods; (3) the granting of differential and exceptional rates, and (4) changes in the traffic arrangements and facilities. On other important matters, moreover, the General Council gives opinions from time to time at the request of the Minister of Railways. Although neither the general nor the district railway councils have, so far as I can understand, any precise executive authority to carry out their decisions in the more important matters, yet their opinions carry great weight in shaping the policy, both of the directional and central administrations, and, practically speaking, the decisions of the General Railway Council may be said to determine all alterations in railway rates in Prussia.—*Correspondence London Times.*

### The Ship Canal to the Lakes Again.

A bill has been introduced in the Senate, authorising the President to appoint three persons to confer with any similar committee appointed by Great Britain or Canada, and report as to the feasability of a canal for ocean vessels between the Atlantic and the lakes; where it can be most conveniently located; the probable cost with estimates in detail; and if any part of the canal should be built in Canada what arrangements are necessary to preserve it for use to the people of this country. All the necessary facts relating to the construction and use of such deep water channel are also to be reported on, and it is proposed to appropriate $10,000, or so much thereof as may be necessary for actual traveling and other necessary expenses the members of the commission to serve without pay.

Senator Vilas, of Wisconsin, who introduced this bill, could get all of this information, and more, from any number of the members of the Montreal Board of Trade without expense to the Government, and it would have fully as much value as the information collected by an unpaid commission with only $10,000 at their disposal for surveys, computations and traveling expenses.

### Wheat, Potatoes and Oil.

Evidence that the Rocky Mountain States will grow to be an empire of themselves is furnished in an interview with Receiver Trumbull, of the Union Pacific, Denver & Gulf, recently printed in a Denver paper. Mr. Trumbull says that in the vicinity of Greeley, Col., enough potatoes have been raised during the past year to ship forty cars a day until next June. Refrigerator

cars are furnished and shipments are now sent as far as Texas and Eastern Kansas. At Wheatland, Wy., on the Cheyenne Northern, 95 miles north of Cheyenne, 40,000 acres of land have been supplied with ditches for irrigation, and settlers there expect to raise large crops of wheat this year. The oil fields near Caspar, Wy., on the Fremont, Elkhorn & Missouri Valley, are now shipping good lubricating oil to Denver. The manager of the Pennsylvania Oil Company, at that place, reports that he has made a large contract for furnishing lubricating oil to the Atchison, Topeka & Santa Fe, and to the Union Pacific, Denver & Gulf. His company hopes to build a refinery at Caspar.

### Railroad Foreclosures in 1894.

The number of roads placed in the hands of receivers in 1894 was 38; mileage, 7,025; bonds involved, $196,247,000; capital stock, $199,144,000; total bonds and stock, $395,791,000. This shows a great decrease from the figures of 1893, when the receiverships represented 74 roads, aggregating 29,340 miles, with bonds and stock amounting to $1,781,046,000. The number of roads sold under foreclosure in 1894 was 42, aggregating 5,643 miles and representing $164,216,000 of bonds and $154,783,000 of stock, or a total of $318,999,000 of bonds and stock. In 1893 the number of sales was 25, the mileage 1,613 and the capitalization $79,924,000.—*Railway Age.*

### Thaxton Wreck Due to Act of God.

The Virginia Supreme Court of Appeals on Dec. 21 decided the case of the Norfolk & Western Railroad against Marshall's administrator in favor of the railroad company, the decision of the Circuit Court of Bedford County being reversed. This case grew out of the Thaxton disaster, which occurred on the night of July 1, 1889, in which ten passengers perished. The train ran into a washout on a high embankment, under which there was a stone culvert which had been there for 35 years, and always before had carried off the waters of the heaviest storms. On that night there was a series of cloudbursts around the base of the Peaks of Otter, and from one of these the water accumulated so deep against this embankment that it washed out the culvert, and the train coming along soon thereafter ran upon the rails, which were still in place, and sank into the chasm below, causing a terrible calamity. The defense of the railroad company was that the accident was caused by the act of God in the shape of this unprecedented storm, and that no diligence on its part could have prevented the accident. The plaintiff's attorneys contended that the railroad company could have avoided the consequences of the act of God by ordinary care. The jury fixed the damages at $7,500, and the Circuit Court gave judgment against the company. Now the Court of Appeals declares that no negligence of any kind whatever was proved against the company, and that it is not responsible for the damage sustained.

### The Latest Improved Punch Photograph.

The Consolidated Traction Co. gives very liberal transfers, enabling citizens of Jersey City and Newark to go from almost any place in either city to any place in the other. To prevent cheating, the company has devised a ticket, on the top of which are printed in a row the faces of five men and two women. There is a smooth-faced man, the man with a mustache, and another with side whiskers, a fourth with chin whiskers, and the fifth with a full beard. There are only two women—one meant to be young and the other old—a hat designating the former, and a bonnet the latter. There is, also, as an additional safeguard, a mark just under the heads, which when punched according to instructions shows the age of the holder to be more than or less than 40 years. Now, what conductor will presume to decide in an instant on the most delicate matter—a woman's age? Think of the possibilities of trouble, and then you will not wonder why the company has decided that for a time, at least, the faces are not to be punched nor ages decided for passengers.—*New York Herald.*

### South American Notes.

As a result of the recent visit of Mr. Barrow, General Manager of the Buenos Ayres Great Southern Railway, to the United States, the American system of handling and transporting cattle will be introduced upon that line.

The proposal to gridiron the province of Buenos Ayres with light narrow gage railroads has awakened a lively controversy in South American circles over the relative merits of narrow and broad gage roads. The farmers demand better transportation facilities, apparently following the lead of the planters in São Paulo, Brazil, where light roads, following the highways, have apparently given great satisfaction. Chili has also enacted a law facilitating the construction of similar rural railroads, intended, like those proposed for Buenos Ayres, to assemble agricultural products at stations on the trunk lines from a considerable distance back in the country.

The trade returns of Argentine for the first nine months of 1894 show a total of imports amounting to $70,100,000 gold, and of exports amounting to $80,500,000 gold, being larger than for the same period of any year since 1890. The total trade of the United States with Argentine has reached the value of $10,000,000, being 6.4 per cent. of the total foreign commerce of that republic. This is a gain of 1.7 per cent. since 1891.

The Córdoba & Rosario Railroad, Argentine, reports general improvement in all directions. The freight traffic for the last fiscal year was 252,000 tons, as against 199,000 tons in the previous year.

The recently issued report of the Peruvian Corporation is discouraging. The returns from railroad and navigation traffic for the past year work out at a small excess in net revenue over those for the previous year, but the fall in exchange from 58 cents to 50 cents has more than neutralized this apparent improvement. What is still worse is that the Southern Railway, from Mollendo on the coast to Lake Titicaca, which has been the best revenue producer in the country, shows a marked decrease in traffic, with an increase in expenses, due to the higher cost of fuel. The net revenue of the corporation from all sources has been only $693,266.48, which is pretty bad for a company representing the interests of bondholders the face value of whose claims amounts to $275,000,000, nor does it appear much better if we take these bonds at the figure used in converting them into shares of the Peruvian Corporation, which was $80,190,000. The value of these holdings at current market prices is only $4,702,050. The attempt to relieve a nation of its load of foreign indebtedness by the organization of a company absorbing the bonds, with the interests of the bondholders secured by a cession of all the railroads of the Republic with much besides, appealed to the imagination strongly as a clever stroke of financiering and diplomacy. But what has been the issue? The construction of an additional 205 miles of railroad by the corporation at an estimated cost of $16,000,000 has not been accomplished, although $15,000,000 have been expended in the repairs and equipment of existing lines. The great development which was to have followed the rehabilitation and extension of transportation facilities has not been realized. Consequently the government, which was to have had an increased revenue, so that it could easily pay the corporation an annuity of $400,000, has not only been unable to meet this obligation, but owing to the fall in exchange and depression of business, has been unable even to meet its ordinary expenses.

At the Plateuse Co.s workshop at Buenos Ayres recently a bow plate below the waterline on the steamer Eolo was repaired without docking the vessel, by floating a caisson alongside, caulking the connection with the vessel lightly, and pumping the caisson dry.

The Pacific Steam Navigation Co., of Great Britain, announces a new schedule, greatly shortening the time between England and South American ports. The time between Montviedeo and Buenos Ayres to Santiago, Chili, via the Straits of Magellan, will henceforth be only 10 days.

The new reservoir for the city of São Paulo, Brazil, has just been completed. It has a capacity of 7,000,000 litres (29,587,600 gallons) and henceforth the supply of water to the city will be increased to more than double its present amount.

The State Legislatures of Para and Amazonas, Brazil, have asked for bids for laying a cable up the Amazon, from Para to Manáos, a distance of 1,000 miles, landing at 13 towns on the way. The establishment of telegraphic communication to Manáos will probably make it the center of the Brazilian rubber trade, as it is in the center of the rubber district, and is accessible at all seasons of the year by vessels of 28 ft. draught. One steamship line from New York, one from Liverpool, one from Lisbon, and one from Rio de Janeiro, makes regular monthly trips to this port at present. The States named offer an annual subvention to a cable company of £17,000.

### The "Maine Law" in Illinois.

The Chicago & Alton has recently strengthened its previous prohibition of drinking when on duty by promulgating the following comprehensive order:

"The use of intoxicating drinks and frequenting of gambling places or other places of low resort has proven a most fruitful source of trouble to railways as well as to individuals. Recognizing this fact, this company will exercise the most rigid scrutiny in reference to the habits of employees in this respect.

"The use of beer or other intoxicating liquor by an employee of this company while on duty is strictly prohibited, and no employee will be allowed to have such liquors in or about any station, shop or yard or other premises of this company at any time or under any circumstances.

"Any conductor, trainman, engineer, fireman, switchman, or other employee, who is known to use intoxicating liquors or frequent gambling places or other places of low resort, either while on or off duty, will be promptly and permanently discharged from the service of this company. Heads of departments, subordinate officers and foremen are hereby instructed to see these rules are strictly enforced at all times."

### Quebec's Aid to Railroads.

Since the inauguration of the policy of assisting railroad construction in the Province of Quebec by means of land and money grants, the sum of $2,849,620 has been paid by the provincial government, leaving still to be paid $721,024 besides $3,315,480 representing the value of the second twenty-five cents per acre of the balance of the converted land subsidies when the lands are sold. This outlay for railroad construction is exclusive of the $13,504,643 paid to date for the Quebec, Montreal & Ottawa Railroad sold afterwards to the Canadian Pacific Company for $7,600,000. This is independent of subsidies paid by the Dominion Government.

## LOCOMOTIVE BUILDING.

The Baldwin Locomotive Works have shipped two decapod locomotives to the Trans-Caucasian State Railroad.

The Cleveland, Cincinnati, Chicago & St. Louis is reported as considering the ordering of about six locomotives.

It is reported that the Duluth, Missabe & Northern will soon be in the market for locomotives.

The Delaware & Hudson Canal Co. is reported about to order a number of freight locomotives.

The Baldwin Locomotive Works have received orders from the Choctaw, Oklahoma & Gulf Railroad, the Antofagasta Railroad in South America, the Cumberland & Pennsylvania, the Cleveland, Cincinnati, Chicago & St. Louis and the Southern Railway.

## CAR BUILDING.

The Duluth & Iron Range is in the market for 900 cars.

The Columbus, Hocking Valley & Toledo has ordered 100 freight cars from the Pullman Car Works.

The Buffalo, Rochester & Pittsburg order for 200 coal cars has been awarded to the Union Car Company of Depew, N. Y.

The Duluth, Missabe & Northern is considering the ordering of ore cars.

The Allison Manufacturing Co., Philadelphia, Pa., has received an order for a number of cars from the Charleston, Clendennin & Sutton Railroad.

Flint & Co., of 68 Broad street, New York City, are reported as asking bids on freight and passenger cars for South American railroads.

The Cleveland, Cincinnati, Chicago & St. Louis is reported as considering the ordering of stock and box cars.

The Wagner Palace Car Co.'s shops, at East Buffalo, are now working with a force of 550 men, considerably more than have been engaged during the summer. They are engaged chiefly on repair work, and the only new construction being one car for use in the Raymond-Whitcomb excursion service.

The Ensign Manufacturing Co., of Huntington, W. Va., has received an order from the Chesepeake & Ohio Railroad for 100 patent stock cars. The cars are very similar to the Canada cattle car but are built from modified plans by Mr. W. S. Morris, Superintendent of Motive Power of the Chesapeake & Ohio. They will have the improved arrangement for watering and feeding cattle in transit, and are to be arranged for use on the return trip for carrying coal and other heavy freight. The cars will have the Westinghouse air brake, Janney couplers, National Hollow brake beams and Butler draft rigging.

## BRIDGE BUILDING.

**Detroit, Mich.**—Application will be made at the next session of the Canadian parliament for authority to enable the Canadian-Michigan Tunnel Co. to construct a bridge over the Detroit River and a tunnel under the river.

**East St. Louis, Ill.**—The East St. Louis & St. Louis Bridge and Construction Co., of East St. Louis., has been chartered to build and operate a bridge across the Mississippi river. Capital stock, $500,000. Incorporators, H. D. Sexton, George Schaub and John Niens.

**Edmundston, N. B.**—Messrs. Malcolm & Ross have given notice that application will be made at the next session of the Dominion Parliament for the incorporation of a company to build bridges across the River St. John, at Claire, St. Hilaire, Edmundston and St. Leonards.

**Ottawa, Ont.**—The Dominion Government is calling for tenders for the construction of the pivot pier and abutments of a swing bridge over the Burlington Channel, near Hamilton, Ont.

**Pittsburg, Pa.**—Application will be made Jan. 14 for a charter for a new bridge from Aspinwall, over the Allegheny River, to Butler street extension, in Highland park. The Citizens Traction Co. is said to be interested in the project.

**Philadelphia.**—The old wooden bridge on Sixth street, over the Richmond branch of the Reading Railroad, will soon be displaced by a steel girder structure, the contract for which has lately been awarded by the city to Jones, Pollard & Co., who have already sublet the steel construction to the Shiffler Bridge Co., of Pittsburg. The bridge will have 23 plate girders, set 12½ ft. apart. Sixteen of these girders are to be the full width of the structure, 66 ft. The steel girder required for the south end will be 123 ft. long and 9 ft. 10 in. deep. The contract price of the work is nearly $70,000.

**Port Huron, Mich.**—The new bridge to be built across Black river will, according to the plans of City Engineer Rogers, be a one-swing span 160 ft. long. It will have a roadway 18 ft. wide, and a sidewalk 6 ft. in the clear on each side. The approaches will consist of 220 feet of steel trestle work, 40 ft. on the south side and 180 ft. on the north side. They will be 32 ft. wide. The elevation of the bridge will be 17.4 ft. above the river, or 32 ft. above the bed of the stream.

**Scranton, Pa.**—Councils have approved and Mayor Connell has signed the resolution awarding the bridge contracts, mentioned in last week's issue, and construction work will now be pushed to an early completion.

**St. Boniface, Man.**—A new bridge will be constructed between Winnepeg and this town.

## RAILROAD LAW—NOTES OF DECISIONS.

### Powers, Liabilities and Regulation of Railroads.

In Texas it is held that a bridge owned by a railroad on its line of road is properly returned for taxation as so much mileage of railroad, and cannot be again taxed as a bridge.[1]

In New York it is held that at common law a railroad is under no obligation as a common carrier to afford accommodations to hackmen for transaction of their business of carrying passengers to and from the depots of the company.[2]

In Kansas it is ruled that a division superintendent of a railroad has authority to employ physicians and surgeons to attend employees injured in the service of the company.[3]

In the Federal Court it is laid down that a railroad receiver, who resides at a distance from the property, and commits its active management to others, is not entitled to the full compensation usually paid to railroad presidents and receivers who are the active executive heads of going railroads.[4]

The Supreme Court of Texas rules that a promise by the general manager of the lessee of a railroad to allow an employee his expenses as part of his salary, will not render the lessor liable for the payment of such expenses after the termination of the lease.[5]

The Virginia statutes allow railroad companies to make a certain charge for the shipment of produce and other articles; and "for the weighing, storage, and delivery of articles at any depot or warehouse of the company; a charge may also be made, not exceeding the ordinary warehouse rates charged in the city or town in which, or nearest to which, the depot or warehouse is situated;" but forbid a railroad company "to charge or receive any fee or commission other than the regular transportation fees, storage, and other charges authorized by law for manifesting, receiving, or shipping any goods or other articles for transportation on such railroad." The Supreme Court holds that said statutes do not forbid a charge of $1 per day for the detention of a car more than 72 hours after notice to the consignee of its arrival.[6]

In the District of Columbia it is held that the prohibition in Section 5353 of the Revised Statutes, against transporting nitro glycerine upon vehicles engaged in interstate passenger traffic, extends also to dynamite, which is made by milling nitro glycerine with some solid and inert absorbent substance, and contains no other explosive ingredient.[7]

In Iowa it is ruled that the statute which makes railroad companies liable for injuries to stock "running at large," at all points where a right to fence exists, and the injury results through the want of such fence, and provides that running trains on depot grounds where no fence exists, faster than eight miles an hour, shall be deemed negligence; that the provision in regard to running on depot grounds applied only to injuries to stock "running at large," and not to personal injuries received by the driver of a horse and wagon.[8]

### Injuries to Passengers, Employees and Strangers.

In Kansas it is held that a railroad is not bound, as a part of its contract to transport a passenger, who is employed as a traveling salesman, to carry as his personal baggage a case of sample merchandise belonging to his employers; and where it receives and checks such case without knowledge of its ownership or contents, a part of which is afterwards stolen from its baggage room without negligence on its part, it is not liable to the owners.[9]

In Georgia it is held that there can be no recovery for plaintiff's ejection from a train when it appears that the ticket he presented had expired by its own limitation before he took the train, as he knew, and that in buying it he did not tell the agent that he desired a different sort of ticket.[10]

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1 Schmidt v. G. H. & S. A., 24 S. W. Rep. 547.
2 N. Y. C. & H. R. v. Sheeley, 27 N. Y. S. 185.
3 Union Pac. v. Winterbotham, 34 Pac. Rep. 1052.
4 Central Trust Co. v. C. J. & M., 58 Fed. Rep. 500.
5 G. H. & S. A. v. Scheidemantel, 24 S. W. Rep. 328.
6 N. & W. v. Adams, 18 S. E. Rep. 673.
7 United States v. Saul, 58 Fed. Rep. 763.
8 Cohoon v. C. B & Q., 57 N. W. Rep. 727.
9 S. Kan. v. Clark, 34 Pac. Rep. 1054.
10 Lewis v. W. & A., 18 S. E. Rep. 650.

In Texas a passenger started to get off the train, as soon as it stopped, on the usual side, but, seeing another train between that and the depot, and nobody to help her, she tried to get off the other side. The train, however, started before she succeeded, and in jumping to the ground she was hurt. It did not appear that one side was safer to alight than the other, though there was a brakeman on the other side, assisting passengers, but not at plaintiff's car. The Supreme Court rules that the passenger was free from negligence.[11]

In Colorado it is held that a company operating its cars by electricity is bound to use extraordinary care, and is liable for slight negligence.[12]

The Supreme Court of New York holds that a railroad is guilty of negligence if a passageway from its waiting room at a station to its railroad tracks is so narrow that persons intending to take trains cannot safely walk along it.[13]

In Texas it is held that a railroad, after it has discovered a trespasser on one of its cars, is bound to afford him an opportunity to leave without exposing him to unnecessary danger, and is liable for his death, caused by his being forced to leave the car while in motion.[14]

In Louisiana it is held that where a deaf-mute uses a railroad track as a highway, he assumes the risk of danger, and to render the railroad company liable for his death gross negligence, amounting to malice, must be shown.[15]

In Georgia the Supreme Court rules that a railroad is not liable for killing, by the derailment of a car, caused by fast running, one walking outside its track at a point in the country not customarily used by pedestrians.[16]

The Federal Court holds that though a derailment would not have occurred but for the running of the train at a speed greater than that allowed by schedule, yet, if the train running at such speed would not have been derailed had a rail been in good condition, the defective condition of this rail is the proximate cause of the derailment.[17]

In Missouri, deceased, walking on defendant's railroad bridge, was met by the bridge watchman, who motioned him to go back. Deceased remained standing, and the watchman went to him, and they spoke together, when deceased started back, and the watchman struck him twice with a billy. Deceased then ran back a long way across the bridge, pursued by the watchman, who at last shot deceased in the back, and killed him. The Supreme Court rules that the jury was warranted in finding that the watchman was acting in the course of his employment.[18]

In New Jersey, one walking on a street in the daytime came to the defendant's intersecting railroad, which consisted of three tracks. He stopped upon the first track, which was not in use, for a freight train, going towards his left on the furthest track, to pass. This train emitted smoke, which settled down on the tracks, and when it had passed, knowing that the middle track was used for trains coming from his left, he looked towards the left, and seeing nothing but smoke on the tracks, and hearing no whistle or bell, he proceeded at his usual gait, and was struck by a train coming from the eft on the middle track. The Court of Appeals holds that he was guilty of contributory negligence.[19]

[11] G. C. & S. F. v. Vinson, 24 S. W. Rep. 956.
[12] Denver Tram. Co. v. Reid, 35 Pac. Rep. 269.
[13] Redner v. L. & H. Co., 26 N. Y. S. 1050.
[14] T. & P. v. Mother, 24 S. W. Rep. 79.
[15] Schexnaydre v. T. & P., 14 South Rep. 513.
[16] Holland v. Sparks, 18 S. E. Rep. 990.
[17] Clyde v. R. & D. 59 Fed. Rep. 394.
[18] Haehl v. Wabash, 24 S. W. Rep. 737.
[19] West Jersey v. Ewan. (N. J. Err. & App.) 27 Atl Rep. 1064.

## MEETINGS AND ANNOUNCEMENTS.

**Dividends.**

Dividends on the capital stocks of railroad companies have been declared as follows:

*Concord & Montreal*, $1.50 per share, payable Feb. 1, 1895.

*Delaware, Lackawanna & Western*, 1¾ per cent., payable Jan. 21.

*Little Schuylkill Navigation Railroad and Coal Co.*, 3½ per cent., payable Jan. 11.

*New York Central & Hudson River*, 1¼ per cent., payable Jan. 15.

**Stockholders' Meetings.**

Meetings of the stockholders of railroad companies will be held as follows:

*Brockwayville & Daguscahonda*, annual, Philadelphia, Pa., Jan. 14.

*Crawford Junction and McKean County*, annual, Philadelphia, Pa., Jan. 14.

*Daguscahonda & Elk*, annual, Philadelphia, Pa., Jan. 14.

*East Broad Top Railroad & Coal Co.*, annual, Philadelphia, Pa., Jan. 14.

*Lehigh Valley*, annual, Philadelphia, Pa., Jan. 15.

*Philadelphia & Reading*, annual, 12th and Market Sts., Philadelphia, Pa., Jan. 14.

*Philadelphia, Wilmington & Baltimore*, annual, Wilmington, Del., Jan. 14.

*Pickering Valley*, annual, Philadelphia, Pa., Jan. 14.

*Reading & Columbia*, annual, Philadelphia, Pa., Jan. 14.

*Western New York & Pennsylvania*, annual, Philadelphia, Pa., Jan. 14.

**Technical Meetings.**

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *New York Railroad Club* meets at the rooms of the American Society of Mechanical Engineers, 12 West Thirty-first street, New York City, on the third Thursday in each month, at 8 p. m.

The *New England Railroad Club* meets at Wesleyan Hall, Bromfield street, Boston, Mass., on the second Wednesday of each month.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, N. Y., on the fourth Wednesday of January, March, April, September and October, at 10 a. m.

The *Southern and Southwestern Railway Club* meets at the Kimball House, Atlanta, Ga., on the third Thursday in January, April, August and November.

The *Northwestern Railroad Club* meets at the Ryan Hotel, St. Paul, on the second Tuesday of each month, at 8 p. m.

The *Northwestern Track and Bridge Association* meets at the St. Paul Union Station, on the Friday following the second Wednesday of March, June, September and December, at 2.30 p. m.

The *American Society of Civil Engineers* meets at the House of the Society, 127 East Twenty-third street, New York, on the first and third Wednesdays in each month, at 8 p. m.

The *Western Society of Engineers* meets on the first Wednesday in each month, at 8 p. m. The headquarters of the society are at 51 Lakeside Building, Chicago.

The *Engineers' Club of Philadelphia* meets at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturdays of each month, at 8 p. m.

The *Engineers' and Architects' Club of Louisville* meets in the Norton Building, Fourth avenue and Jefferson street, on the second Thursday in each month, at 8 p. m.

The *Association of Engineers of Virginia* holds informal meetings on the third Wednesday of each month, from September to May, inclusive, at 710 Terry Building, Roanoke, at 8 p. m.

The *Boston Society of Civil Engineers* meets at Wesleyan Hall, 36 Bromfield street, Boston, on the third Wednesday in each month, at 7.30 p. m.

The *Engineers' Club of St. Louis* meets in the Missouri Historical Society Building, corner Sixteenth street and Lucas place, St Louis, on the first and third Wednesdays in each month.

The *Engineering Association of the South* meets on the second Thursday in each month, at 8 p. m. The Association headquarters are at The Cumberland Publishing House, Nashville, Tenn.

The *Engineers' Society of Western Pennsylvania* meets in the Carnegie Library Building, Allegheny, Pa., on the third Tuesday in each month, at 7:30 p. m.

The *Technical Society of the Pacific Coast* meets at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., on the first Friday in each month, at 8 p. m.

The *Denver Society of Civil Engineers* meets at 36 Jacobson Block, Denver, Col., on the second and fourth Tuesdays of each month except during July, August and December, when they are held on the second Tuesday only.

The *Montana Society of Civil Engineers* meets at Helena, Mont., on the third Saturday in each month, at 7.30 p. m.

The *Engineers' Club of Minneapolis* meets in the Public Library Building, Minneapolis, Minn., on the first Thursday in each month.

The *Canadian Society of Civil Engineers* meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday, at 8 p. m.

The *Civil Engineers' Club of Cleveland* meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month, at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.

The *Engineers' Club of Cincinnati* meets at the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati, O., on the third Thursday in each month, at 7:30 p. m. Address P. O. Box 333.

The *Foundrymen's Association* meets at the Manufacturers' Club, Philadelphia, Pa., on the first Wednesday in each month.

The *Western Foundrymen's Association* meets in room 701, Western Union Building, Chicago, on the third Wednesday of each month. B. W. Gardner, Monadnock Block, Chicago, is secretary of the association.

The *Association of Civil Engineers of Cornell University* meets on Friday of each week at 2:30 p. m., from October to May inclusive, at their Association Rooms in Lincoln Hall, Ithaca, N. Y.

**American Society of Civil Engineers.**

ANNUAL MEETING.

The forty-second annual meeting of the society will take place January 16 and 17, 1895. The programme has been so far perfected that an outline is here given:

Wednesday, January 16.—Business meeting of the society, beginning at 10 A. M., in the church corner Lexington avenue and 23d street. Lunch will be served in the house of the society. On the evening of this day at the Hotel Waldorf a reception, conversazione and informal dance at which a supper will be served, will be tendered in the name of the resident membership to all visiting members and the ladies of their families, and to such other guests as the board of direction may think it desirable to invite.

Thursday, January 17.—There will be an excursion to Willett's Point, where the Engineering School will be visited by invitation of Col. W. R. King, Corps of Engineers, U. S. A. Lunch will be served on the steamer. On the evening of this day, Charles E. Emery, M. Am. Soc. C. E., will deliver a lecture on "The Utilization of the Forces of Nature," illustrated by lantern slides. Ladies of the families of members are invited to attend the excursion and lecture.

The committee on arrangements are: Charles Warren Hunt, Alfred H. Myers, Alfred W. Trotter.

**Engineering Association of the South.**

The regular monthly meeting of the Association was held December 13, with President Dr. W. L. Dudley in the chair.

The secretary was ordered to send out letter ballots to the members to ascertain the sentiment of the Association in regard to becoming a member of the Associated Engineering Societies; said ballots to be canvassed by the board of directors in time to notify said association of the club's intention before January 1, 1895.

Mr. H. D. Ruhm was elected to fill the vacancy caused by the resignation of Mr. W. B. Ross from the office of secretary.

The paper of the evening was read by Captain W. C Smith, subject, "The New State Prison," giving an elaborate description of what is designed to be one of the best arranged and equipped prisons in the country.

**Boston Society of Civil Engineers.**

A regular meeting of the Boston Society of Civil Engineers was held December 19, President William E. McClintock in the chair, 98 members and visitors present.

The secretary read a memoir of Charles W. S. Seymour, late of Hingham, prepared by a committee of the society, consisting of M. M. Tidd; F. M. Hersey and C. W. Howland.

Mr. James W. Rollins, Jr., resident engineer of the N. Y., N. H. & H., at Brockton, opened the evening's discussion by reading a very interesting paper entitled, "Abolition of Grade Crossings, particularly those on the Providence Division and at Brockton, on the Old Colony Railroad."

The first part of Mr. Rollins's paper was devoted to the general considerations of the subject and to a history of the legislative acts bearing on the question. The second part of the paper gave an account of the work proposed to be done to abolish the crossings in Boston on the Proivdence Division and to a more detailed description of the work now under way abolishing the crossings at Brockton, Mass.

Mr. Charles A. Allen, of Worcester, Mass., spoke on the general subject of the abolition of grade crossings and gave a history of what had been done at Northampton, Mass.

Mr. John W. Ellis, of Woonsocket, R. I., spoke briefly on the subject and Mr. F. Herbert Snow, City Engineer of Brockton, discussed the question from the municipal side. Messrs. G. A. Kimball and E. K. Turner also took part in the discussion.

JANUARY MEETING.

At the meeting of the society to be held on January 23, 1895, Mr. Croydon T. Purdy, of New York, will read a paper entitled, "The Use of Steel in Large Buildings." The paper will be very fully illustrated by lantern views.

## PERSONAL.

—Mr. A. E. Ricqles has resigned as Live Stock Agent of the Rio Grande Western.

—Mr. Benjamin Williams, a retired purchasing agent of the Baltimore and Ohio Railroad, died last week at Baltimore.

—Mr. H. C. Vincent has been appointed General Freight and Passenger Agent of the Toledo & Ohio Central Extension, with headquarters at Marietta, Ohio.

—Mr. Thomas J. Nixon, at one time Superintendent of the Cincinnati, Richmond & Fort Wayne Railroad, died at his home, at Richmond, Ind., on Dec. 24, aged over 70 years.

—Mr. J. W. Channer has been appointed General Freight and Passenger Agent of the Lake Erie & Detroit River Road, and the London & Port Stanley Road, both in Ontario, with offices at Chicago.

—Mr. C. A. Desasseure has been appointed General Passenger Agent of the Memphis & Charleston Railroad, with headquarters at Memphis, to succeed Mr. B. W. Wrenn, resigned.

—Mr. W. A. Bissell has been appointed Assistant Freight Traffic Manager of the Atchinson, Topeka & Santa Fé. Mr. Bissell will resign the position of General Freight and Passenger Agent of the Atlantic & Pacific, with headquarters at San Francisco.

—Mr. W. B. Kniskern has been appointed General Passenger Agent of the Chicago & Northwestern Road to succeed Mr. W. A. Thrall, who has resigned to retire from the service. Mr. Kniskern has been Assistant General Passenger Agent of the road.

—Mr. W. Dale Harris, engineer of the Ottawa & Gatineau Valley Railroad has been appointed Managing Director of that railroad, and will also shortly be appointed Managing Director of the Pontiac & Pacific Junction road, still retaining the position of Chief Engineer of both lines.

—Mr. G. R. Stanton, who has for the past six years held the position of Telegraph Inspector for the Mexican Central Railroad, has resigned, and that position will be abolished Dec. 31. Mr. Stanton will return to the United States, where he has had 25 years' experience in telegraph matters. He will be located for the present at Decatur, Ill.

—Mr. Chester W. Bliss, who has been in the service of the Boston & Albany for eight or ten years in subordinate positions, has been made Assistant General Superintendent with office at Springfield. This title has been vacant for several years. Mr. Bliss is a son of the President of the road and grandson of Chester W. Chapin. He has seen service on the Pennsylvania as well as on the Boston & Albany.

—Mr. B. W. Wrenn, General Passenger and Ticket Agent of the Memphis & Charleston Railroad, has resigned to become Passenger and Traffic Manager of the Plant system of railroads and steamships, with offices at Savannah, Ga. Mr. Wrenn was General Passenger Agent of the East Tennessee, Virginia & Georgia Road for many years, until the organization of the Southern Railway Co., and the transfer of the East Tennessee lines to that company.

—Mr. Robert E. Pettit, a former Pennsylvania Railroad officer, died in Philadelphia, on Dec. 29. He entered the service of the Pennsylvania Railroad as rodman in the engineering corps, and by successive promotions became Superintendent of the main line between Philadelphia and Pittsburg. While Superintendent of the New York Division, his good management in preventing the big Newark railroad strike from extending down the line won him the compliments of the officers of the road. In 1890, after having served the railroad for quarter of a century, he retired, and spent several years in travel.

—Mr. David C. McWatters, Secretary to General Passenger Agent E. A. Ford of the Pennsylvania lines west of Pittsburg, has been appointed District Passenger Agent for the Pittsburg district in place of Mr. J. G. Ruple, resigned. Mr. McWatters began his railroad career with the Pennsylvania in 1881, starting with Mr. R. F. Smith, now President of the Cleveland & Pittsburg, who was at that time general manager. After a time he was transferred to the passenger department as chief clerk to Mr. C. L. Kimball, Assistant General Passenger Agent at Cleveland. In 1892 he became Secretary to General Passenger Agent Ford.

—Colonel George E. Waring, of Newport, R. I., has been appointed by the Mayor of New York to the head of the Department of Street Cleaning, to succeed Commissioner Andrews, and will take office Jan. 15. Colonel Waring is very well known indeed as a municipal engineer, and particularly for his work in the department of sewerage and drainage. He had a good war record, is a man of position and character, and presumably of considerable administrative ability. That he will do vastly better for New York than any commissioner has done in recent years is highly probable. He certainly could not do worse than the present incumbent.

—Mr. Alexander Mackay, for the past ten years General Freight Agent of the Mchigan Central, has resigned from that office. Mr. Mackay will be succeeded by B. B. Mitchell, who has been General Manager of the Blue Line Fast Freight for the past 16 years. Mr. Mitchell is 48 years old, and has been in the railroad service since 1867, having been with the Blue Line Fast Freight continuously since that date. The office of the General Freight Agent, is to be removed from Chicago to Detroit. Mr. Mackay's resignation was the result of this decision of the company, as he did not desire to change his residence from Chicago. Mr. Mackay has been in the railroad service for the past 31 years, having been connected with the Michigan Central for 27 years, leaving the service of this company for one year to take the general freight agency of the Chicago & Atlantic.

—Mr. John N. Reynolds has recently accepted the position of Western representative of the *Railroad Gazette*, with his office at 1138 The Rookery, Chicago. It is hardly necessary for us to introduce Mr. Reynolds to any of the readers of the *Railroad Gazette*. There are few men so widely known and so well known as Mr. Reynolds among railroad officers, and those who manufacture and deal in railroad supplies; there are few men who have so many friends as he has in these classes. His business career has brought him in contact with the representative men of the railroads and the manufacturing houses all over the United States, and the people who know him best have long ago discovered his many good qualities. It would be hard to find in his business a man at once so honorable, so enterprising and so amiable.

## ELECTIONS AND APPOINTMENTS.

*Baltimore & Ohio.*—J. B. Watkins has been appointed Auditor of Revenue for the company. Mr. Watkins succeeds Captain George W. Booth, who has been made General Auditor in place of the late William T. Thelin. Mr. Watkins was formerly Chief Clerk in the office of the Auditor of Revenue, but for the past year has been Auditor of the Merchants' & Miners' Transportation Co.

*Boston & Albany.*—Chester W. Bliss has been appointed Assistant General Superintendent with office at Springfield, Mass.

*Buffalo, Attica & Arcade.*—E. V. Dunlevie has been appointed General Freight and Passenger Agent and Auditor of the road.

*Cartagena-Magdalena.*—U. D. Warren, formerly Superintendent of Bridges on this railroad, has been appointed Engineer of Maintainence of Way, with headquarters at Cartagena, Colombia, S. A. Mr. Butler, the former Chief Engineer, becomes Superintendent of the railroad, with headquarters at Cartagena, and the office of the Chief Engineer has been abolished.

*Detroit & Mackinaw.*—The following are the Directors of this company, organized to succeed the Detroit, Bay City & Alpena road: Anthony J. Thomas, holding 100 shares; C. H. Coster, of New York, 19,400 shares; N. Gibbs, of New York, 100 shares; Don M. Dickinson, of Detroit, 100 shares: Frank Fletcher, Detroit, 100 shares, and George M. Crocker, Mount Clemens, Mich., 190 shares.

*Illinois Central.*—The jurisdiction of F. B. Harriman, Superintendent of the Freeport Division from Chicago to Freeport, Ill., has been extended to Fort Dodge, Iowa. The Division will then include 775 miles of track. The Division headquarters will be removed from Freeport to Dubuque.

*Lake Shore & Michigan Southern.*—H. F. Ball has been appointed General Car Inspector of this company, vice F. H. Soule, who has resigned to accept a position with another company.

*Michigan Central.*—Barrett B. Mitchell, for a number of years General Manager of the Blue Line, one of the Vanderbilt fast freight lines, has been appointed Freight Agent of this road. The appointment carries with it the removal of the General Freight Agent's office from Chicago to Detroit.

*Missouri, Kansas & Texas.*—The company has just created the office of Assistant General Manager, and A. A. Allen has been appointed to that position. Mr. Allen has been the General Superintendent, that position being now abolished and merged with that of Assistant General Manager.

*Mobile, Jackson & Kansas City.*—At a recent meeting of the stockholders of the company, the following Directors were elected: H. Austill, F. A. Luling, A. S. Benn, W. H. McIntosh, W. H. Lienkauf, J. W. Whiting, Rufus Dane and James K. Glennon, of Mobile; F. B. Merrill, of New York City, and A. G. Hastings and A. G. Chaster, of London, England. The Directors elected Hon. H. Austill, President, and F. B. Merrill, Vice-President. Mr. T. W. Nicol was chosen Secretary *pro tem.*

*Ogden, Hot Springs & Wind Cave.*—The officers of this company, recently organized at Odell City, S. D. are Abel W. Odell, President, Odell City, S. D.; A. W. Riordan, Vice-President; Emmett B. Cook, Secretary, of Buffalo Gap, S. D.; Charles M. Wilcox, of Hot Springs, S. D., Treasurer, and James M. Baldwin, Chief Engineer, of Hill City, S. D.

*Philadelphia & Reading.*—J. H. Sessions, formerly with the old I. B. & W., the Baltimore & Ohio, C. C. C. & St. L., and Terre Haute & Peoria road has been appointed Northwestern freight agent of this road, with headquarters at Minneapolis.

*Pittsburg, Shenango & Lake Erie.*—W. K. Richards has been appointed General Freight Agent to succeed W. H. Garrett, resigned.

*Pittsburg, Akron & Western.*—A. S. Miller, formerly Chief Clerk in the freight department of the Cleveland, Akron & Columbus, has been appointed Acting General Freight and Passenger Agent of this company, with head quarters at Akron, O.

*Quincy, Omaha & Kansas City.*—J. M. Savin, formerly Auditor, has been appoined General Manager and Agent for the trustees to succeed Amos Green, resigned.

*Rome, Watertown & Ogdensburg.*—At the annual meeting of the stockholders of the railroad company, held on Dec. 29, the following Directors were elected: Chas. Parsons, Clarence S. Day, Charles Parsons, Jr., Edwin Parsons, William Lummis, Chauncey M. Depew, H. Walter Webb, John Thorn, William M. White, J. F. Maynard, Walton Ferguson, George Parsons, John M. Crouse. At a subsequent meeting of the Board, the following officers were elected: Charles Parsons, President; Clarence S. Day, First Vice-President; Charles Parsons, Jr., Vice-President; J. A. Lawyer, Secretary; Edwin Parsons, 3d, Treasurer and Assistant Secretary.

*South Carolina & Georgia.*—At a meeting of the Directors of the railroad company, on Dec. 29, Asbury Hull, of Augusta, Ga., was elected a Director to fill a vacancy.

*Wabash.*—J. S. McGuian, for a quarter of a century Division Roadmaster on the Wabash, has resigned, which has resulted in a number of transfers and the promotion of Foreman William Nietmann to be a Division Roadmaster, with headquarters at Ottumwa, Ia.

*Wheeling & Lake Erie.*—T. Leonard, formerly General Yard Master, has been appointed Car Service Superintendent, a newly-created office.

## RAILROAD CONSTRUCTION, Incorporations, Surveys, Etc.

**Canadian Roads.**—Notice has been given that application will be made to the Dominion Parliament for an act to incorporate a company to construct a railroad from the town of Clearwater, N. W. T., to Baldur, Glenboro, Carberry and Neepawa, thence to the Hudson Bay. Mr. Gregory Barrett, of Colgary, N. W. T., is solicitor for the applicants.

**Carson & Colorado.**—R. J. Laws, the Assistant Superintendent of the railroad, has begun the preliminary survey for a new road to extend from Winnemucca to Kennedy, Nev., a new mining camp. If the survey shows a favorable line for a road between these points, the work of construction will be commenced early in the spring.

**Cobourg, Northumberland & Pacific.**—Mr. Frank Turner, C. E., of Bracondale, Ont., has been appointed Chief Engineer of the road, which is shortly to be built by English capitalists, from Cobourg, via Campbellford, to a junction with the Central Ontario and Canadian Pacific roads, east of Peterboro, Ont.

**Erie, Edinboro & Cambridge.**—A meeting of the projecters of this line was held at Erie, Pa., last week, for the purpose of formulating plans for building and operating the road. Capitalists from Brockton, Buffalo and New York will furnish one half the capital stock, and the local people are expected to take the other half.

**Middletown & Cincinnati.**—This company, with a capital stock of $200,000, was incorporated at Columbus, O., last week, to construct a line from Middletown to Kings' Station, Warren county, O. The incorporators are Frank H. Ray, T. C. Simpson, Paul J. Sorg, John Auer, and W. L. Dechant. The corporation is a reorganization of the Middletown & Cincinnati Railroad of 1890, which Congressman Paul J. Sorg purchased at receiver's sale this year. The motive power of the line may be changed from steam to electric power.

**Odell, Hot Springs & Wind Cave.**—The organization of this company at Odell City, S. D., has been recently completed, and A. W. Odell elected President and J. M. Baldwin, of Hill City, S. D., Chief Engineer. The grading and bridging is completed from the Odell siding, on the Fremont, Elkhorn & Missouri Valley road branch, from Buffalo Gap to Hot Springs, S. D., one mile to Odell City, which is to be standard gage. From Odell City, the survey is completed for a narrow gage road, on a maximum grade of four per cent. grade, leading up a canyon, and around the famous Battle Mountain, connecting with the Burlington & Missouri at Hot Springs, S. D. This portion of the line is about ten miles long, and passes eighteen sandstone quarries. A survey has been made for a branch on a three per cent. grade, leaving the Odell City and Hot Springs line, three miles from Hot Springs, extending to Wind Cave, eight miles. Of this cave there has been explored underground, ninety-four miles.

**Pittsburg & Eastern.**—The stockholders of the three projected roads, the Loyalhanna & Youghiogheny, the Philadelphia & Pittsburg, and the Pittsburg & Eastern Railroad Companies, have agreed to merge the three lines into one, their interests being identical. The consolidated lines will be known as the Pittsburg & Eastern, and the work of construction will be commenced in the spring. When completed, the line will extend from West Newton, Pa., on the Youghiogheny River, where it will connect with the Vanderbilt lines, to a connection with the Beech Creek Road, another Vanderbilt line, at Mahaffey. People identified with the Loyalhanna Coal & Coke Co. are the largest stockholders in the consolidated lines.

**Pittsburg & Lake Erie.**—Some extensive changes on the Pennickey branch are contemplated. The grade of the tracks in Homestead, Pa., to the bridge was recently raised. It is intended next to have the long trestle at Rankin filled in and a second track laid. At Braddock the tracks to the Rankin industries will be moved. They now parallel the railroad and interfere with travel. Next summer they will be moved to the river front and connections made with the main line.

The company is also contemplating an extension along the west side of the Monongahela River from Brownsville into the valuable coal and oil fields of West Virginia, via Morgantown and Fairmont.

**Tennessee Central.**—A contract has been closed for the completion of the road from Crossville via Rockwood and Harriman to Clark's Ferry, opposite Kingston, Tenn. State convicts in large numbers will be used to work on the road. President J. Baxter met the Harriman Chamber of Commerce on Dec. 27, in the interest of the road.

## GENERAL RAILROAD NEWS.

**Chicago & Southeastern (Ind.).**—This company has not been running trains for some months on account of attachments under which the rolling stock has been levied on, but the officers announce that the road will be opened to Brazil, Ind., on Jan. 1, and regular passenger and freight trains will be run between Anderson, in the natural gas belt, to Brazil, the center of the Clay county coal fields. The western terminus of the line is at Waveland at present. When opened, the line will be 137 miles long, and will be extended to Muncie next year, an additional 20 miles. Henry Crawford, Jr., is General Manager.

**New York, Lake Erie & Western.**—The gross earnings of this company are reported as follows, for November, including all leased and operated lines:

| | 1893. | 1894. | Dec. |
|---|---|---|---|
| Gross earnings | $2,396,372 | $2,230,438 | $165,934 |
| Operating expenses | 1,641,911 | 1,555,336 | 86,575 |
| Balance | 754,461 | 675,102 | 79,359 |
| Rentals | 218,919 | 209,036 | 9,882 |
| Net earnings | 535,542 | 466,066 | 69,477 |

OCTOBER TO NOVEMBER, INCLUSIVE.

| | 1893. | 1894. | Dec. |
|---|---|---|---|
| Gross earnings | $5,118,490 | $4,586,655 | $531,834 |
| Operating expenses | 3,347,343 | 3,098,848 | 248,495 |
| Balance | 1,771,147 | 1,487,807 | 283,339 |
| Rentals | 481,640 | 437,685 | 43,953 |
| Net earnings | 1,289,507 | 1,050,122 | 239,386 |

**Oregon Short Line & Utah Northern.**—The American Loan and Trust Co., of Boston, has filed in the United States Court, at Helena, Mont., a bill for the foreclosure of the first mortgage, $10,895, 000, on the Oregon Short Line & Utah Northern Railway, and that a separate receiver be appointed for the line.

**Pennsylvania.**—The statement of the earnings of the lines east of Pittsburg and Erie, for November, show a gross gain of $177,700 over last year, and by reducing expenses $33,700, enables the company to show a gross gain of $211,400. The comparative statement for November and 11 months, follows:

| November. | 1894. | 1893. | | Inc. or Dec. |
|---|---|---|---|---|
| Gross earnings | $5,465,854 | $5,288,150 | I | $177,704 |
| Operating expenses | 3,557,569 | 3,591,288 | D | 33,719 |
| Net earnings | 1,908,286 | 1,696,862 | I | 211,424 |
| Since January 1st. | | | | |
| Gross earnings | $53,550,464 | $61,072,347 | D | $7,521,883 |
| Operating expenses | 36,758,865 | 43,408,317 | D | 6,649,452 |
| Net earnings | 16,791,599 | 17,664,030 | D | 872,431 |

All lines west of Pittsburg and Erie, for November, show a gross increase of $287,763, and a net increase of $378,856.

**Philadelphia, Germantown & Chestnut Hill.**—This company, a branch of the Pennsylvania Railroad, has filed a consolidated mortgage for $2,000,000. Part of the bonds to be issued are to be paid to the Pennsylvania Railroad for advances made for the construction of the Cresheim branch from Allen's Lane to a point on the Trenton cut-off. Some of the proceeds are also to be devoted to retiring $500,000 debenture bills which the Pennsylvania issued for the construction of the Cresheim branch.

**Philadelphia & Reading.**—Special Master Crawford, in the receivership of the Philadelphia & Reading Railroad, has filed his report in the United States Circuit Court, recommending that the receivers be authorized to make sale of certain Port Richmond wharf property, at Philadelphia, upon the Delaware River, and known as Pier No. 20.

**St. Joseph & Grand Island.**—The Central Trust Co., of New York City, has filed a petition in the United States Court at Omaha, asking for the foreclosure of the mortgage on this road and the appointment of separate receivers for the company, which is operated as one of the lines of the Union Pacific system. The petition also asks for the sale of the bridge over the Missouri River at St. Joseph. The mortgage was filed July 1, 1885, and was for $7,000,000. There is now due the trust company $7,420,000.

## TRAFFIC.

### Traffic Notes.

The Seaboard Air Line has shortened the time of its fast through freight trains so that freight is now delivered in Atlanta in sixty-one hours from the time it leaves New York. The Interstate express freight runs from Portsmouth to Atlanta, 598 miles, in thirty-two hours.

The railroad commissioners of Texas have prepared a tariff on live stock, on which hearings were to be held January 3. The coal tariff promulgated November 20, was considered on December 21, and will be further discussed at a public hearing on January 19.

The Trunk Lines and Central Traffic roads have concluded not to advance the rates on cotton piece goods. It is said that the complaining merchants secured a promise from one minor road to continue the old rates, and that forced the association to abandon the advance altogether.

A San Francisco paper states that the California State Railroad Commissioners have approved a new freight tariff of the Southern Pacific, reducing rates on grain 15 per cent. From Fresno to San Francisco, where a mule team freight line has lately been started, the reduction is from $3.60 a ton to $3.

The Postmaster General, in his annual report, says that the cost of carrying newspapers in the mails is eight times as much as the Government receives for the service. As the price received is one cent a pound, this would make the cost $8 per 100 lbs., which, presumably, includes the expense of handling and of superintendence. The average length of haul, which, necessarily, must be estimated, is not stated.

### Chicago Traffic Matters.

CHICAGO, Jan. 2, 1895.

Freight traffic in both directions continues disappointing. Eastbound shipments last week fell off nearly 10,000 tons from the preceding week, and were over 83,000 tons behind the corresponding week of 1893. A considerable portion of the tonnage of the last week of 1893, however, was on account of the impending advance in the rates on January 1.

Passenger traffic, especially to southern points, is much better than was anticipated. The California travel is also encouraging.

The passenger representatives came to a standstill last Saturday, owing to the non-representation of the Union Pacific and Canadian Pacific, and adjourned until tomorrow under a resolution providing that unless all the lines were represented at the meeting when it reconvenes and proceed to take up the work where it was left, that an adjournment should be taken sine die. Serious obstacles have developed within the past few days and the outlook for the immediate formation of a new trans-continental association is far from promising. The Union Pacific wants the other lines to go ahead and make an agreement and it will consider it. This line also demands that the specially conducted excursion business be discontinued. As this would seriously affect the Atchison, the Rock Island and the Alton, there is not the slighest possibility that it will be done. The Canadian Pacific flatly refuse to put its westbound immigrant business into the clearing house or sign the new agreement until the other roads withdraw the commission payments in excess of its own from Canadian ports. Even then, it wants to run its immigrant business itself and report to the clearing house. The other roads only agreed to give it a share of the business and a differential on Port Arthur with the distinct understanding that it first join the immigrant clearing house. Consequently, they now say that until the Canadian Pacific joins the immigrant clearing house the payment of commissions will continue. Still another hitch is the reported repudiating by the Southern Pacific of its recent agreement with the Atchison regarding side-rides to San Francisco and San Diego.

A meeting of the Chicago Freight Commitee has been called for January 8, to consider the eastbound situation. Several complaints have been made that some of the weak lines were not maintaining the agreement. The situation generally is in pretty fair shape, but there are some annoying matters which apparently need fixing.

The Chicago Great Western has ordered agents to accept mileage ticket coupons in payment for excess baggage charges.

The 1895 pass agreements of the western and central traffic lines have gone into effect in much better shape than did the western lines' agreement of 1894. All the roads are apparently desirous of maintaining the agreement and it is predicted that so much pressure has been brought and the details of the agreements so carefully perfected in advance of their taking effect that any line being desirous of breaking them will hesitate some time before attempting to find a pretext for so doing. But "the proof of the pudding is in the eating."

Both the Chicago & Northwestern and the Burlington are maintaining their schedules on the two new fast mail trains between Chicago and Omaha and the operating departments. On the first day both trains entered the Union station at Omaha within two minutes of each other, the Northwestern leading with the Burlington closely following on a parallel track. The run is being made in eleven hours, twenty-five minutes, including stops and delays. The length of the Northwestern line is 493 miles and the Burlington 508.

### Eastbound Shipments for the Year.

Eastbound shipments from Chicago, reported weekly in these columns amounted for the year 1894 to 2,862,070 tons as compared with 3,281,280 tons for 1893. The number of tons carried by each road was as follows:

| | Tons. | p. c. |
|---|---|---|
| Michigan Central | 274,457 | 9.6 |
| Wabash | 269,765 | 9.5 |
| Lake Shore and Michigan Southern | 377,734 | 13.4 |
| Pittsburg, Fort Wayne and Chicago | 357,421 | 12.5 |
| Pittsburg, Cincinnati, Chicago & St. Louis | 402,610 | 14.0 |
| Baltimore and Ohio | 186,732 | 6.5 |
| Chicago and Grand Trunk | 272,151 | 9.5 |
| New York, Chicago and St. Louis | 308,702 | 10.7 |
| Chicago and Erie | 308,416 | 10.7 |
| Cleveland, Cincinnati, Chicago & St Louis | 102,082 | 3.6 |
| | 2,862,070 | 100.0 |